micro & nano Mag

MICRONARC

The Magazine of the micro-nanotech Cluster of Western Switzerland

IV - 2021

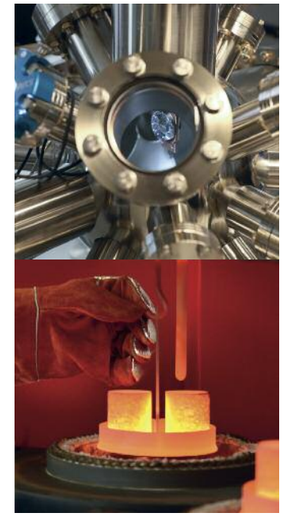
SENSORS & MEASURING DEVICES
AERONAUTICS & SPACE
MACHINES, INDUSTRIAL EQUIPMENT & AUTOMATION
COBOTICS
AUTOMOBILE
ELECTRONICS, MICRO-ELECTRONICS
MEDICAL
ENERGY
WATCHMAKING
TELECOMMUNICATIONS
MATERIALS
R & D + SERVICES
SUB-CONTRACTING

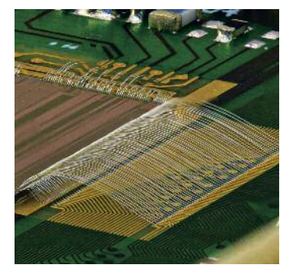
Environmental commitment

Superocean Heritage II Chronograph 44 Ocean Conservancy Limited Edition in steel with silver dial and blue-striped satin NATO ECONYL® strap.

Breitling has an ace up its sleeve when it comes to diving: the Superocean, created in 1957 for professional divers. The model was not, however, to be confined to devotees of the deep. Yachting and water sports fans quickly made it a sports watch that was prized for both its style and performance. So what could be more natural than to give this diver's timepiece a new lease of life in the form of the Superocean Heritage that revives the 1950s design? And it is this latest model that has been chosen to mark the partnership between Breitling and the Ocean Conservancy, whose missions to protect marine ecosystems and clean up the world's beaches it shares and supports. The watch is equipped with an ECONYL® strap, made from recycled nylon fishing nets. This innovative material also highlights the connection between Breitling and Outerknown, a sustainable clothing brand co-founded by 'Breitling Surfer Squad' member Kelly Slater.

Source: Watches The Guide





IMPRESSUM

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Dear reader,

Welcome to the fourth edition of your Micro&Nano Mag, published by Micronarc, the micro-nanotech cluster of Western Switzerland. This is a special enhanced edition with more than 100 pages in order to include a brand-new Digital Section.

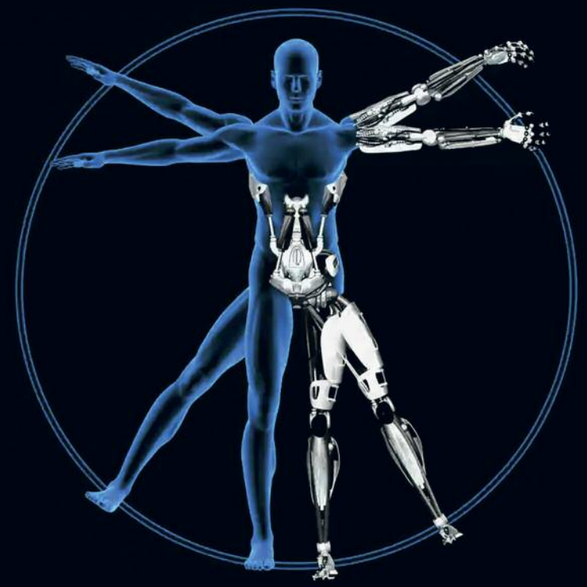
Danick Bionda, Secretary General of Micronarc

Our goal is to valorize and promote the most innovative products and technologies from our region. We invite you to discover the new developments of more than 35 inspiring companies and organizations:

- miniature atomic vapor-cell Quantum devices, for sensing and metrology,
- new industrial humanoid robots, as well as sophisticated micro-assembly machines and smart factories,
- medical innovations and wearable devices for early detection of cancer with 3D array of ultrasound probes,
- top level education, research and innovation centers, incubators and facilitators from the 7 cantons of Western Switzerland,
- high precision processes and new materials with superior levels of performance, up to concrete 3D printing!
- Edge AI, Industry 4.0, IoT, Telemedecine, smart water solutions,
- traditional and hybrid time masterpieces, with connected functionalities and solar energy system,
- new successful and innovative business models like watchmaking crowdfunding campaigns,
- electric-hydrogen racing prototypes, in a domain with a promising future.

The innovations that will shape this future, will benefit from past and present ones - «nani gigantum humeris insidentes», i.e. «dwarfs standing on the shoulders of giants». While Switzerland has mastered time for the past 3.5 centuries, dematerialization's pace has quite accelerated in the last decades. Us or our children will live the «technological singularity». Then the new paradigm will be transhumanism. Undeniably, micro&nanotechnologies, the core domain of Micronarc, will play a key role in these transformations to come.

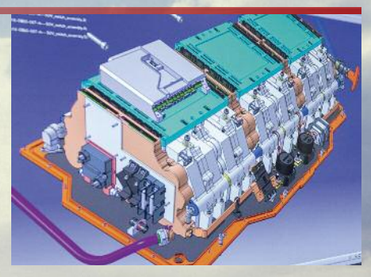
We wish you a happy reading!



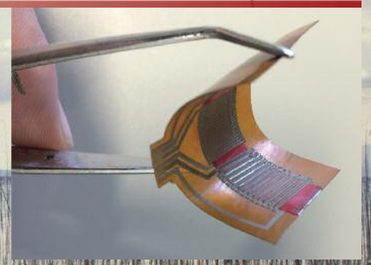
Switzerland: innovation & reliability

Living creatures need to perceive what is pertinent, useful, vital to them. Human societies too. Today, small sensors and smart sensing systems assess everywhere our environment, energies, processes, health… with the finest details. This new stage of global evolution has Western Switzerland as a preeminent actor.

La Ramée, Lake of Neuchâtel



High-power electric-hydrogen propulsion systems for the truck industry



Flexible fluxgate sensor comprising pad printed solenoid coils around a soft magnetic core with the ability to detect the Earth's magnetic field

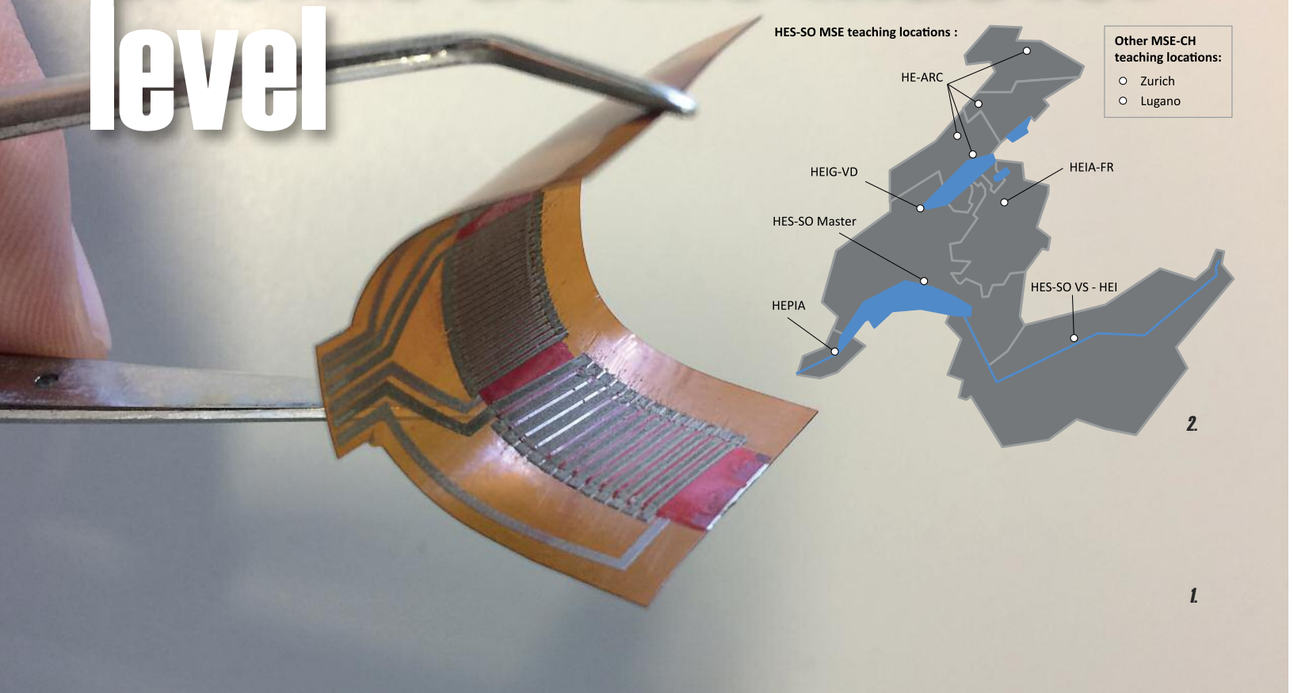
Re-think product development based on AM – compliant mechanism development with the ESA

«Education and technology development are a fight against ignorance and misery. Let's fight!»

Philippe Passeraub, UAS Professor and MSE Head at HES-SO

In collaboration with all Swiss UAS, the Master of Science HES-SO in Engineering is upgraded to adapt to evolving industry needs, to strengthen links with each profession and to improve coherence with bachelor programs. Good news: a Microengineering profile will open in 2021!

HES-SO opens a Microengineering profile at the master level



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© HES-SO Guillaume Perret

This article aims to inform professionals about the reshaped Master of Science in Engineering (MSE) from the Swiss Universities of Applied Sciences (UAS) with special focus on its deployment at HES-SO in Western Switzerland (Haute école spécialisée de Suisse occidentale) and on the creation of a Microengineering profile at this level.

In critical times when society and economy are shaken, changes are vital to face and overcome the accompanying challenges. Technology, competencies and education are key factors to allow companies to accommodate, evolve and even contribute to these changes. Master programs such as the MSE at HES-SO play an essential role in such times: engineers are gaining deeper knowledge, up-to-date skills and experience with experts or highly qualified professionals. This is achieved in close collaboration between the HES-SO MSE and the industry. The MSE consists of 90 ECTS credits taking 3 (full time schedule) or 5 semesters (part-time schedule). The HES-SO MSE program is taught in Lausanne at the HES-SO Master center and in 5 engineering schools of HES-SO (HE-ARC, HEIA-FR, HEI-VS, HEIG-VD, HEPIA). Participating students are:

- Bachelor graduate students from UAS programs in engineering;
- engineers active in the industry willing to complete their education after several years of experience;
- exchange or regular international students with professional experience, wishing to gain a specialization including a strong focus on applied research;
- MSE students from other Swiss UAS.

This new Microengineering profile is part of a complete redesign of our HES-SO MSE. This redesign will be offered in 2021. Its most visible change is the increased number of profiles from 4 to 7:

- Civil Engineering
- Computer Science
- Data Science
- Electrical Engineering
- Energy and Environment
- Mechanical Engineering
- Microengineering

Other changes include not only new names common for all Switzerland, but also revisited, updated and evolving programs. HES-SO will be the only UAS offering Microengineering.

Microengineering is this unique capability to master miniaturization in engineering, with all possible aspects related to it. Its main objective is to increase in products the functionalities number in a finite volume. Engineers with this profile therefore require a wide range of knowledge and skills. As UAS Bachelor programs are intended to be professional, our students are therefore quickly oriented towards a professional activity. The field of microengineering today faces an increasing number of challenges to improve its competitiveness and so requires a multidisciplinary expansion that cannot be all covered in a 3-year professionalizing Bachelor's degree. These challenges include digital transition, dematerialization, smart services, sensor networks and energy harvesting plus sustainable microengineering production and products. These themes are common to the different sectors of activities such as watchmaking, robotics, instrumentation or medical technologies, without forgetting the manufacturing means dedicated to this industry.

1. An example of a MSE Master thesis in collaboration with two Swiss industrial partners active in pad printing and in magnetic field measurements: a flexible fluxgate sensor comprising pad printed solenoid coils around a soft magnetic core with the ability to detect the Earth's magnetic field [1].

2. HES-SO MSE program is taught in various locations in Western Switzerland. Lectures from other MSE-CH locations are also accessible. With COVID-19 distance teaching modes have been introduced.

3. Since 2009 HES-SO is training young engineers in its Master of Science in Engineering (MSE) program.

The Microengineering profile of the MSE therefore aims to:

- strengthen theoretical bases and multidisciplinary skills required to meet such challenges, as well as in a general way transverse competencies of microengineering;
- improve soft skills such as creativity, communication in a multicultural environment, problem solving and team management.

With the new MSE profiles at HES-SO, including in particular Microengineering, we aim to better prepare engineers to practice their profession in a world with rapidly evolving societal and economical challenges.

www.hes-so.ch/mse

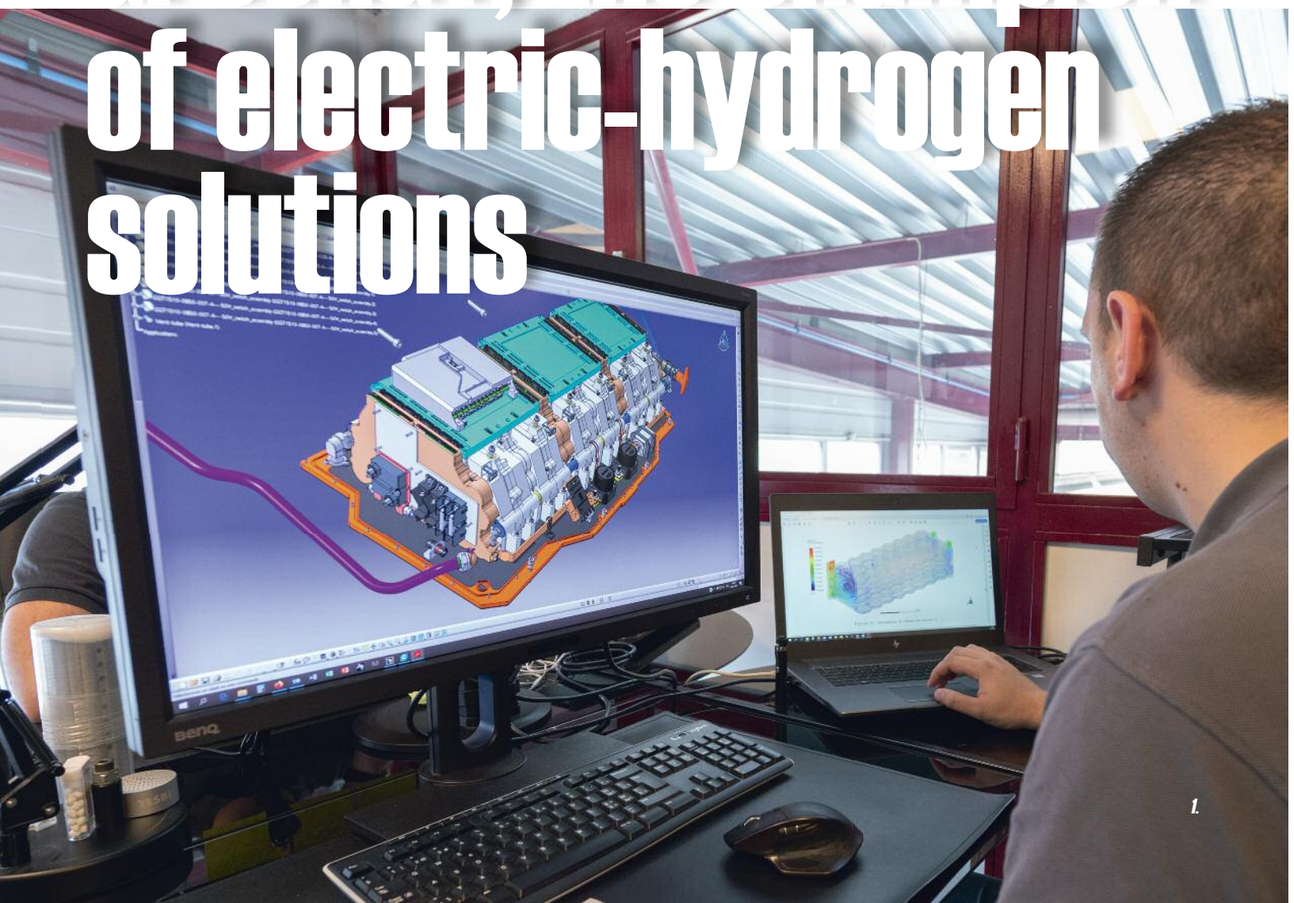
[1] *Spyridon Schoinas et al., Sensors 2020, 20, 2275; doi: 10.3390/s20082275*

«The electric-hydrogen solution brings a rational and realistic approach to the future of sustainability for the industrial sector of heavy duty transport as well as for public and private communities and industries.»

Christophe Ricard, GreenGT's President

In a few months GreenGT will celebrate its 13th anniversary with a move to a new factory in Collombey-Muraz in the swiss canton of Valais. The new premises will provide much more space as well as being more modern and better adapted to its development in a domain with a very promising future.

GreenGT, the champion of electric-hydrogen solutions



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GreenGT is the Swiss champion of electric-hydrogen solutions. It was founded in 2008 and today it is presided over by Christophe Ricard, its reference shareholder, and the young company is one of the European trailblazers in energy transition at the service of mobility and the regions. «My driving passion is the future,» explains its visionary president who has enjoyed a very successful career in the bio-tech industry. «A tangible future consists of controlled solutions. The technology of the electric-hydrogen generator, the fuel cell, is a credible and efficient answer. GreenGT was created, exists and has grown with the support of this reality.»

GreenGT has built up its excellence first of all by working on high-powered electric-hydrogen mobility. By developing its first power units aimed at the heavy transport industry the team of engineers gathered round Jean-François Weber has built up critical experience. He is one of the founders and is now the general manager of GreenGT SA and also the man in charge of research and development.

«At the start we had to prove the merit of our solutions,» recalls Weber who many experts today consider as one of the international benchmarks in this field. «The conquest of space was carried out thanks to the electric-hydrogen generator. What was reliable, safe and efficient in such a hostile environment and in such ultra-demanding conditions should be also capable of powering a lorry on the road. But we had to demonstrate this to be true!»

Racing prototypes and lorries, the same technological challenge

So what better way to achieve this than the construction of high-performance prototypes! A series of vehicles launched with the H2 in 2012 was so promising that they persuaded the Automobile Club de l'Ouest, the organiser of the 24 Hours of Le Mans, to team up with GreenGT to prepare for the introduction of a category for electric-hydrogen prototypes at the 2024 edition of the famous race. This was how the MissionH24 programme was born.

Away from the circuits GreenGT applies its experience and expertise to the service of land-based, maritime and air industrial projects in several countries in Europe. In Switzerland, for example, in the context of the GoH! programme run in collaboration with Migros (supermarkets), SIG (Geneva Industrial Services) and Larag (dealer of commercial vehicles), Weber and his team have developed a 44-ton truck capable of covering 1000 km per day with a refuelling stop of a few minutes every 500 km. Currently road tested for its homologation. In time, GreenGT will be able to produce short runs of electric-hydrogen power units for this programme and the others it's working on in its new factory in Collombey-Muraz.

Another area of expertise: hydrogen in the regions

In a related domain and because of its advance in the field of electric-hydrogen solutions, GreenGT came up against problems that nobody had previously faced to solve, in particular those concerning the infrastructures and the regions. «Where and how to produce hydrogen locally, how to transport it, make it available, supply fleets or buildings? We had to come up with our own answers to these new issues. So we've acquired additional expertise that enables us to intervene as advisor or operator, including training, in public and private communities and industries» explains Christophe Ricard. «Faced with the task that the energy transition represents, thanks to hydrogen we have a local, global and renewable answer. Undoubtedly, there are other technological options to take up this challenge, but none has these assets - which are also those of GreenGT!»

www.greengt.com

Pictures: © GreenGT

3.

1. GreenGT's bases are established in France (GreenGT Technologies, located in Signes near the Paul Ricard racing track), in Switzerland at the Ecole Polytechnique Fédérale de Lausanne (EPFL) and in a brand new building in Collombey-Muraz.

2. MissionH24's LMPH2G electric-hydrogen racing prototype. GreenGT's successful joint-venture with the Automobile Club de l'Ouest. Target: to prepare the introduction of an electric-hydrogen powered racing prototype series at the Le Mans 24 Hours in 2024.

3. High-power electric-hydrogen propulsion systems for the truck industry is one of the core competences of GreenGT. For its clients, GreenGT brings the highest level R&D, prototype creation and small series production to the whole powertrain.

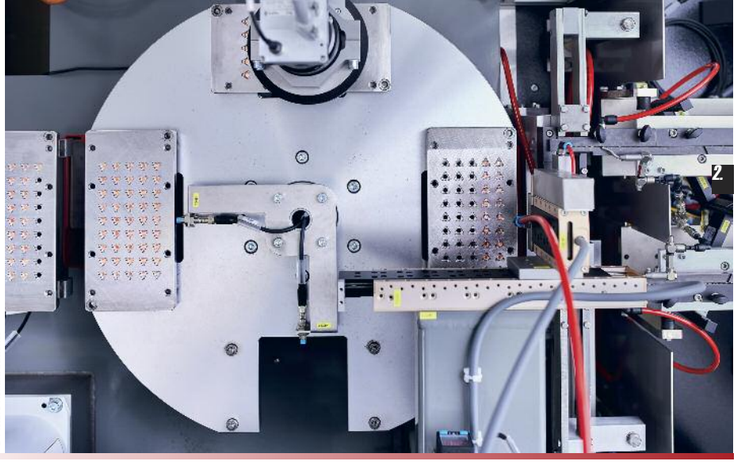
«Managing to extinguish the COVID-19 fire needs the help of smart systems, as biosensors or wearables; Smart systems are also the gears behind the new gold: data. Once the crisis is over, it's data and smart systems that will help us regain our wealth, health & jobs.»

Georges Kotrotsios, VP,
CSEM Marketing & Business Development

Once upon a time… many of us have read the tale of Sleeping Beauty. After pricking her finger on a spindle, the King's daughter falls into a deep sleep that lasts 100 years. In this time, the Princess stays the same, but the outside world continues to change...

Smart, miniature, precise, low-power: important today, key for tomorrow

1



© Picture Renata batteries

2

1. *Re-think product development based on AM – compliant mechanism development with the ESA.*
2. *The neural network developed by CSEM analyzes images and locates small defects on industrial parts.*
3. *Miniature atomic vapor-cell Quantum devices for sensing and metrology application.*

...Slowly, almost imperceptibly. Bringing this story forward into the 21st Century, what would happen if Sleeping Beauty fell asleep in the year 2000 to wake in 2020? Two words that would have entered the common lexicon but be unfamiliar to her are *Big Data* and *COVID-19*. So, how does this modern reworking of the fairytale relate to CSEM? In the real world, this research and innovation hub at the heart of Switzerland's microtechnology region has plenty of answers.

Let's start with COVID-19, a strain of the Coronavirus that would impact Sleeping Beauty in ways she couldn't imagine. She wouldn't wake to a kiss from a Prince but would be following hygiene measures like wearing a mask, sanitizing her hands, and socially distancing. These measures don't rely on any specialized technologies but detecting the virus and its antibodies do. Sleeping Beauty needs microtechnologies: sensors capable of detecting antibodies in the blood or saliva; wearables that can monitor multiple parameters on the human body; powerful miniaturized processors and algorithms to indicate if the virus is present; automated precision instruments to support the reliable screening of new molecules; and to protect those around her, a Bluetooth Low Energy protocol on her smartphone for proximity detection and contact tracing.

Thankfully, for our modern-day Sleeping Beauty, all these technologies are «Made in Switzerland». With a high density of academic institutions and research institutes alongside strong industrial connections, it's not surprising that Switzerland is ranked as the world's most innovative country, and CSEM is an integral part of this ecosystem. We have a long and established portfolio in developing biosensors, wearables, lab automation systems, and medical tools. We also work in the game-changing Organ-on-Chip domain, which has the potential to alter the face of drug development and open new doors when it comes to combatting new illnesses like COVID-19. Connectivity is another Swiss specialty and your smartphone's Bluetooth was likely designed in this country. In 2017, CSEM and the Federal Institute of Technology in Lausanne developed the world's smallest Bluetooth chip, which was made commercially available by EM Microelectronic Marin (another Swiss company).

It is on this theme of connectivity that we can introduce Sleeping Beauty to Big Data. Our newly awake Princess needs connecting to an entire population. The technologies behind the SwissCovid app make this interaction a reality through Bluetooth and its capacity to manage and process large amounts of data–Big Data. The Data Science field was born out of the need for us to store the vast amounts of data we began creating at the turn of the millennium, falling asleep twenty years ago, and this entirely new field of science would have passed you by. CSEM has had the foresight to develop two of its economic prioritization frameworks around teaching and researching Big Data. It now focusses on enhancing and transitioning microtechnologies to bring them into the future. We specialize in creating miniaturized, complex devices that operate at ultra- to low-power, which have advanced computing/communication capabilities, and can be powered by the environment.

Drawing from its legacy in the precision and watchmaking industries, CSEM blends both traditional and future technologies, which perfectly positions it to face the challenges of today. By balancing these elements, we can bring together different networks, advance and enhance the microtechnology domain. If our Sleeping Beauty were to sleep again and wake even in ten years' time, we hope it would be to a world where COVID-19 no longer dominates our lives, and Big Data will be smartly and sustainably used to benefit the future economy.

www.csem.ch

3

For life as well as for technologies, innovation is a question of environments, with their challenges and synergies. Western Switzerland fuels innovation with the richest network for fruitful relationships.

Instrumentations and expertise in the fields of optical and electron spectroscopies

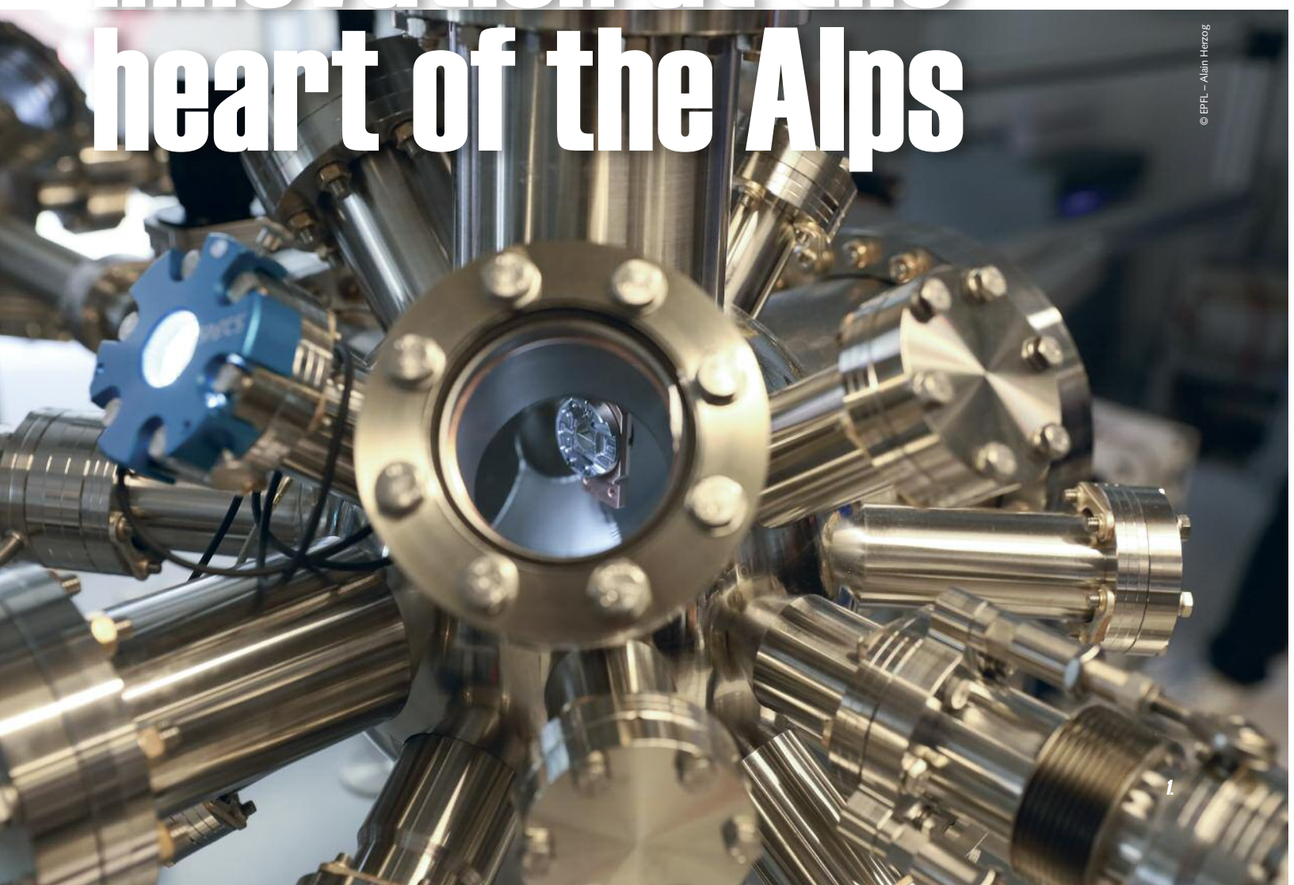
Micro-lubrication of a gear wheel for watches with quantities of 5.0 nL with a volume repeatability of ±10%

Carbon testing laboratory and samples

Bottom, cathedral and old town of Fribourg

EPFL Valais Wallis and its partners from the Energypolis campus are creating an ecosystem for sustainable development, research and innovation. Since its implantation in Sion in 2015, the school has built a solid reputation in the fields of energy, environment and health.

Fostering sustainable innovation at the heart of the Alps



© EPFL – Alain Herzog

1

© EPFL – Alain Herzog

2

1. The researchers at EPFL Valais Wallis have access to state-of-the-art instrumentations and expertise in the fields of optical and electron spectroscopies, as well as nanoscale imaging and force spectroscopy.

2. Dedicated mainly to scientific research and innovation in the fields of energy, green chemistry, health and the environment, EPFL Valais Wallis brings together 226 researchers, administrative and technical staff from 40 different nationalities.

A pole of excellence in research

The origin of EPFL Valais Wallis can be traced back to 2012, when a convention for the implantation of a permanent outpost of EPFL in the city of Sion was signed with the Canton of Valais. Three years later, in 2015, the first researchers began their activities. Since then, the city has also become the home of the Energypolis campus, which aims to bring under one roof EPFL Valais Wallis, HES-SO Valais-Wallis and The Ark Foundation, with a key focus on the fields of energy, green chemistry and the alpine and polar environments as well as health and rehabilitation.

A steady growth

So far, the Canton of Valais and the City of Sion have invested CHF 400 million for the development of the campus, a third of which attributed to EPFL. The research units of EPFL Valais Wallis have also been able to attract more than CHF 85 million from other various sources of funding, notably through the support of European research programs and grants from industrial partners.

«At EPFL Valais Wallis, we are at the forefront of research and innovation around CO_2.»

Vincent Hiroz, Deputy Director EPFL Valais Wallis

This influx of capital has allowed the site to grow steadily. With now 226 employees and researchers from 40 nationalities, including 85 doctoral students, most of the original development objectives stated in the 2012 Convention with the Canton of Valais have been reached and exceeded.

The next phase of the project, dedicated to research on the alpine and polar environments, will bring together 200 additional researchers, including the Swiss Polar Institute, in the new ALPOLE building in early 2022. By then, more than 400 people will be active on the EPFL site in Sion.

Technological platforms and full-scale demonstrators

EPFL Valais Wallis is also equipped with high end technology and shared instrumentation, such as laser laboratories, chromatography, nuclear magnetic resonance, electronic imaging, mass spectrometry or X-Ray diffraction systems. These technological platforms allow the conduct of both deep fundamental and applied research activities.

To facilitate the emergence of more efficient models, notably in the energy domain, researchers at EPFL Valais Wallis, in close collaboration with the HES-SO Valais-Wallis, will soon launch so-called «demonstrators», which are full-scale test facilities for real-world testing of the technologies developed within the laboratories. The selected projects will be close to application, with the Canton of Valais supporting their initial development through a dedicated CHF 5 million fund and with ulterior development perspectives involving private industrial partners.

A strong innovation ecosystem

Several startups stemming from the laboratories and research units of EPFL Valais Wallis have been successfully launched in Sion, where they are able to benefit from the campus's strong innovation ecosystem. Among them, DePoly, which has developed a chemical-based method for recycling PET containers through depolymerization. A disruptive process that has just won the company first place at the 2019 *>>venture>>* competition. The startup is currently scaling-up its technology from the laboratory to the industry and has received support from The Ark Foundation incubator.

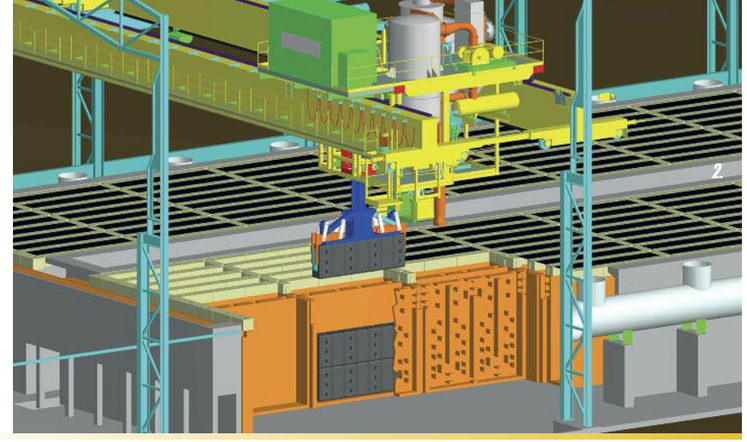
In order to further accelerate the technology transfer along the value chain, the campus will soon include a regional branch of the Switzerland Innovation Park Network West EPFL that will host startups and spin-offs from the Energypolis campus as well as R&D and innovation units from industrial companies. The Innovation Park in Sion will also offer co-working spaces and access to scientific infrastructure, equipment and pre-industrial facilities.

valais.epfl.ch
energypolis.ch

R&D Carbon is the world-leading supplier of know-how in the field of carbon electrodes. Its multi-disciplinary and laterally-thinking team serves the aluminium, petroleum coke, pitch and electrode industries worldwide.

Carbon materials : a deep knowledge serving high efficiency

1.



2.

1. Anode CO_2 reactivity testing.

2. Anode baking furnace.

3. Calibration materials.

After 20 years of successful development work in the field of carbon materials at Swiss Aluminium Ltd (Alusuisse), Werner K. Fischer started his own business in 1986. He took over carbon materials development projects from Alusuisse, which had decided to abandon this sector. He had a clear vision of what the industry needed: an ever better understanding of how electrode quality depends on raw material properties and process parameters.

He built a technology centre in Sierre, Switzerland, where employees of Alusuisse's former carbon research group found a new workplace. Together with Dr. Ulrich Mannweiler, also a former Alusuisse man who joined R&D Carbon in 1988, he set up a new strategy which is still valid today. R&D Carbon employs 30 engineers and skilled technical staff. They serve customers worldwide and maintain an excellent network with technology and trading companies.

R&D Carbon established five distinct areas of activity, each having its clear role:

- Research & Development
- Technical Services
- Carbon Test Equipment
- Laboratory Services
- Trainings & Conferences

R&D Carbon's experts analyze the carbon materials used in the metal industry. With many years of data analysis and a worldwide raw materials know-how, they offer a wide range of analyses to their customers, from single parameter analysis to complete evaluation. Their independent test results are globally recognized. Their long expertise and intensive research into carbon technology provide solid support to R&D Carbon's constant quest to improve product quality. R&D Carbon contributes substantially to reducing metal production costs and lowering capital investment for production plants. The combination of the long experience, specific know-how and wide range of infrastructure allows R&D Carbon giving a real added value to the technical services provided to its customers.

«The aim of R&D Carbon is to improve the quality and the performance of carbon electrodes.»

Matthieu Arlettaz, CEO

Providing outstanding technical services to detect deficiencies and potential for improvement to its customers is an important concern to R&D Carbon, and in fact one of its core businesses. Often it can be challenging to increase the production rate or improve product quality with minimal or no investment. R&D Carbon's services range from technical support for the production of all carbon materials, to plant audits and process optimizations. In its technology center R&D Carbon's specialists conduct pilot or bench scale trials and any kind of laboratory analysis with detailed evaluations. They analyze shipment samples according to standardized ISO methods for certification of the specifications or for arbitration purposes. In the over 30-year old history of R&D Carbon, its services have accomplished major improvements in plants all over the world.

Its easily-operated and reliable test instruments have set worldwide standards for testing carbon products. These test instruments can measure all key properties of carbon materials based on methods approved by DIN, ISO and ASTM standards. 75 % of the world's anode production is monitored with R&D Carbon's test equipment. In their modern workshop they produce over 50 different test instruments. Before shipment, each piece of equipment undergoes several tests such as calibration and cross-checks during the factory acceptance tests to ensure that the equipment is accurate and reliable.

Finally, R&D Carbon organizes conferences in the field of carbon products for the Aluminum industry, as well as training courses about anode raw materials, anode production and anode behavior in the smelter.

www.rd-carbon.com

3.

Stimulate, accelerate and promote innovation is the mission of Microcity in Neuchâtel. Our ambition in relation to small and medium-sized enterprises (SMEs) is to foster the culture of innovation and in particular to support collaborative projects in the context of microtechnology.

On collaborative innovation by Microcity

1

2

Every SME should have the means to innovate. However, innovation often demands complementary resources and skills, which are sometimes difficult to identify and to engage in a complex and/or traditional ecosystem.

Microcity offers SMEs being supported by experienced entrepreneurs, in the framework of a pragmatic and personalised approach. Together, we structure and accelerate your innovation projects.

«The competence density of our region is extraordinarily high, let's innovate together!»

Fabian Käser, head of the SME programme

We work in cooperation with competence partners and networks: Depending on your needs, we open the doors to world-class R&D institutions or provide you with privileged access to companies, specialists, coaches and funding organisations. Our main activites are thus the factfinding, the matchmaking and the alignment to sustain collaborations. To facilitate the access, Microcity launched in November 2020 a matchmaking platform (read the inserted article).

In order to initiate and validate (proof-of-concept) projects fast and straightforward, Microcity, in cooperation with partners, has won the *NTN - Innovation Booster* dedicated to «Future of Microtechnology» (read the inserted article).

NTN – Innovation Booster on «Future of Microtechnology»

In addition to strengthening the support for SMEs, Microcity is pleased to join one of the 12 approved «NTN - Innovation Booster» programs sponsored by Innosuisse. The National Thematic Network in question deals with the «Future of Microtechnology» and aims to animate the ecosystem, to test the feasibility of ideas and to foster the competitiveness of the Swiss microtechnology industry. During the funding period 2021-2024, the program intends to initiate and finance 45 collaborative projects executed in cooperation with actors from industry, economy and research. The NTN - Innovation Booster is managed in cooperation with ARCM, i-Moutier, ITS, AITI, SIP WEST EPFL (core partners) and Innosuisse. Call for action: SMEs with an innovative idea in the context of microtechnology, please contact us.
www.microtechbooster.swiss
Micronarc is involved in the ecosystem of this NTN.

Success Story - Collaboration Project Along the Value Chain

In the field of life sciences (LS) and selective surface treatment, Microcity has initiated a consortium composed of 6 companies. The members represent the added value chain, whereby everyone has a unique selling proposition and thus its own positioning; this excludes a competitive situation between the partners. The competences of the partner companies consist in the formulation of the treatment medium, the automated applicator, the clean room treatment, the quality assurance, and the conformity (manufacturer) of LS products.

In a first step, the consortium, with the help of a specialist and the moderation by Microcity, develops the business intelligence to better understand the relevant market segment, its needs, players and trends. The objectives of this collaborative project are, on the one hand, to enable each partner to optimise its own business development (low-hanging-fruits) and, on the other hand, to identify synergies to sustain the cooperation between the partners.

Matchmaking Innovation Neuchâtel

Microcity's matchmaking platform for collaborative innovation projects. Do you have an idea to make your company evolve? You will be able to identify Neuchâtel's industrial and scientific partners, according to their areas of expertise.

www.matchmaking.microcity.ch

Microcity's unique SME program is bearing its promise

Microcity supports SMEs on innovation, diversification and transformation. We believe that innovation has many facets; besides technology, the notions of efficiency in processes, corporate culture, value of the offer and digitisation (transversal) are of great importance.

Microcity has been stimulated 53 SMEs, discussed and structured 24 ideas owned by SMEs and has initiated 7 collaborative innovation projects since the launch of the SME program in December 2019.

www.microcity.ch

1. Micro-lubrication of a gear wheel for watches with quantities of 5.0 nL with a volume repeatability of ±10%.

2. Watchmaking not only shaped the UNESCO-listed architecture in La Chaux-de-Fonds or Le Locle, its broad technical know-how and tools were a source and inspiration for today's precision microtechnologies in Western Switzerland.

The living world is a place of ingenious solutions at every stage of its complexity. Micro & nanotechnologies opened an entire universe of engineered solutions that Western Switzerland is continuously improving, shaping, manufacturing to the ultimate precision, from the smallest parts to full production chains.

Watch dial feet welding equipment

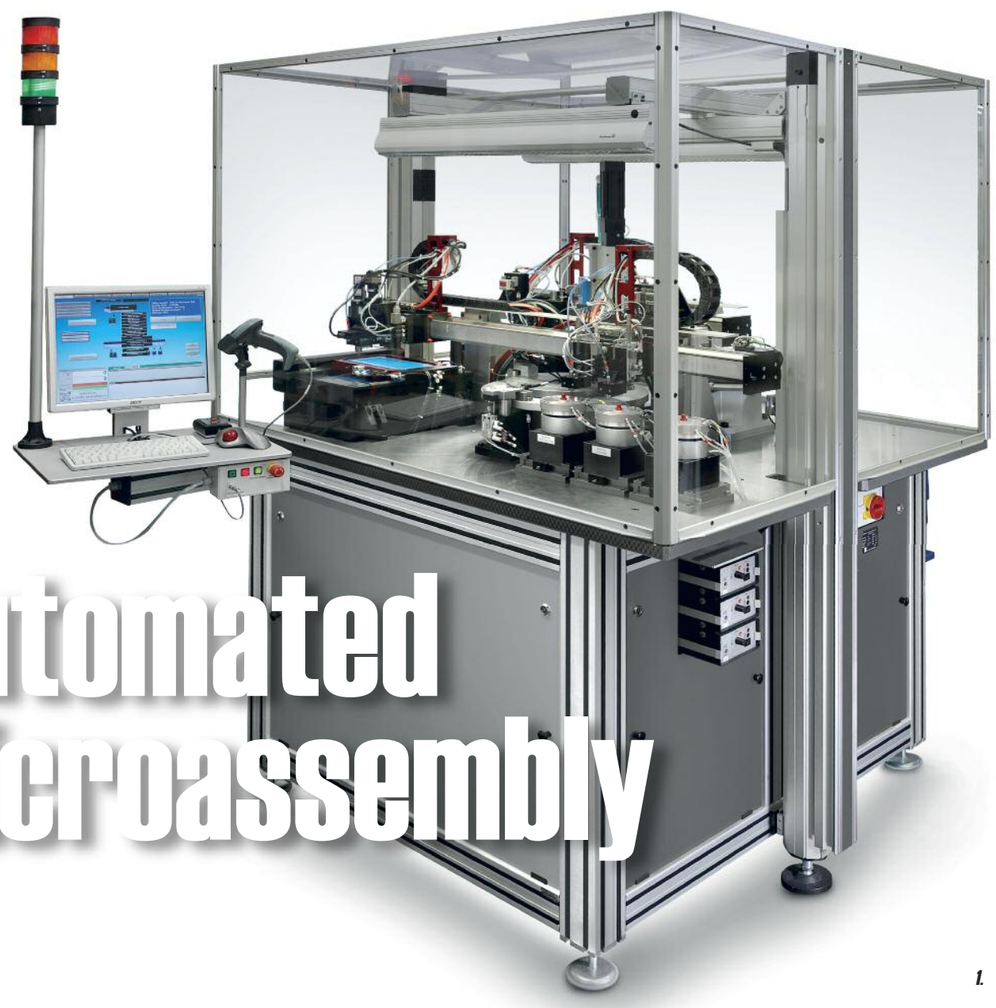
ALPS Vision system acquisition

Compact robotics for watchmaker

The suspended bridge of the Peak Walk on the Glacier 3000, Les Diablerets. Vaud

Since 1991, ALPS Automation SA has been at the forefront in the development of comprehensive electrical and pneumatic automation solutions for renowned, industry-leading clientele active in the pharmaceutical, fine chemical, food, watchmaking, infrastructures and various other sectors. Oriented towards the present and future needs of its customers, as well as anticipating future trends, ALPS Automation keeps on adding new services to its portfolio such as Industrial Vision, Data Automation and lately Machine & Equipment Safety expertise via its sister company ALPS Safety SA.

Automated microassembly



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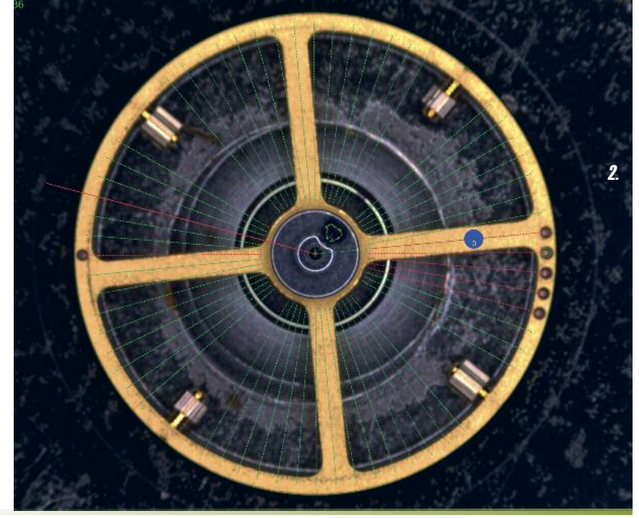


2.

Since its founding in 1973, Petitpierre SA, an ALPS Automation customer, has been active in two key areas: the development and manufacture of high-end watchmaking tools and the assembly equipment of watchmaking and microtechnical components. The company has been established since 1982 in Neuchatel County where it occupies modern and functional premises.

«From the URS till the algorithm of the Industrial Vision solution, ALPS Automation delivered it all.»

Cyril Faivre, Commercial and Marketing Director of ALPS Automation & Safety

Everything related to high-end watch components

Around 1990 a decisive turning point was achieved with the development of semi-automatic and automatic assembly solutions of watch components for major brands, with a special competence in the field of exhaust mechanisms. Everything about high-end watch components is their daily business.

From hand tools to fully automated assembly systems

In the field of watchmaking tools, Petitpierre SA, an ALPS Automation client, has developed a whole range of precision hand tools, contained where necessary in luxurious cases or in specially fitted cases. For example, eight-digit torque screwdrivers or biocompatible soft and fog-proof magnifiers. In this context, tools have been developed and achieved to provide solutions adapted to the specific needs of users, for example, nesting cushions, equipment for flattening the spiral, «hand levers» for lifting the hands of a watch without damaging them, or four-point measuring devices for measuring Ø int. and ext. in the 0.000 of mm.

In the field of assembly solutions, since the achievements are specific to the applications, it is always the same scheme that prevails: a pre-study with, if necessary, feasibility tests for critical functions, then a project submission with detailed offer to the customer. The most critical and decisive element often relates to the design of the fittings, which are necessarily in direct contact with the products to be assembled.

This is how semi-automatic assembly stations, fully automatic assembly machines and complete assembly lines are designed, including all operations, from assembly, forming, crimping, vision control and balancing.

3.

1. Automatic machine for microassembly.

2. ALPS Vision system acquisition.

3. Electrical engineering using E-Plan P8.

Automation, control and vision

«These machines, for example, assemble watch barrels. They are generally composed, among other things, of multi-station rotary tables and palletizers. On the basis of the URS (User Requirement Specification) provided by the customer, ALPS Automation first wrote the Functional Design Specification (FDS). After approval, the automation and supervision experts at ALPS Automation have developed a library of standard objects such as cylinders, motors, axis motors, etc., on a Beckhoff PC basis with Wonderware supervision. Then we programmed the PCs, the supervision, as well as the Cognex machine vision part and finally put into operation all these components» says Cyril Faivre.

ALPS Automation currently employs about sixty employees. «The most important wealth a company has is its human capital» he insists. «We know that without it, nothing is possible, neither today nor tomorrow, and we try to provide everyone with the best possible environment so that they can develop their motivation and creativity. We place particular emphasis on personal initiative and commitment of employees to the company.»

Safety as per 2006/42/CE

Recently a new entity dedicated to Machine Safety has been created called ALPS Safety. The main activities consist in Risk Analysis, Compliance with ISO13849 recommendation, Technical Documentation, Safety audits, 2006/42/CE marking, etc.

ALPS Automation and ALPS Safety are located in Yverdon (Vaud County) and Vouvry (Wallis County) to be as close as possible to its customers (machine builders and end users.)

www.alpsautomation.ch

Since its debut in 1989, the private Swiss company Rollomatic is specializing in the design and manufacturing of high precision CNC grinding machines, cylindrical grinding and laser cutting of ultra-hard materials for the machine tool industry.

From milestones in cutting tools to «humanoid power»

1. NEXTAGE®, a new type of humanoid industrial robot generating greater added value.

2. Innovation and technology are the focus of our solutions for producing high performance cutting tools.

3. With our DNA as cutting tool producers, we are able to assist and support our customers throughout the whole cutting tool manufacturing process.

With its headquarters in Le Landeron, near Neuchâtel, customer-oriented Rollomatic provides complete manufacturing solutions for the grinding of precision tools and parts, as wells as peripheral equipment for wheel dressing and tool measurement.

Working hand-in-hand with the country's top universities, Rollomatic benefits of a close collaboration with the EPFL and is proud to have an office with a team of engineers and students at the Innovation Park in the EPFL Campus in Lausanne. It focuses its research on the 4th industrial generation including the differential geometry, the material science and optics in order to develop new machining processes.

The way to Smart Factory

As a leader in its industry, Rollomatic pays special attention to customer needs and continuously develops its services to maintain high production capabilities of their machines. The company devotes a large part of its work to smart factory, autonomous production, machine connectivity, the Internet of Things (IoT): technologies that are now finding their way into production shop floors.

Continuous data analysis, status monitoring, automated and monitored processes, cooperation with industrial robots – these are the challenges that the factory of the future will face. Thanks to the Smart Connectivity solutions from Rollomatic, these challenges can be much more easily addressed in the field of tool manufacturing.

Industrial robot generating greater added value

The department Humanoid Power of Rollomatic proposes NEXTAGE®, a new type of humanoid industrial robot. Given its human-like frame, it can easily be placed where a person used to stand and perform tasks in locations that are difficult for traditional robots. This robot uses its head and two arms, equipped with cameras, to take over any tedious or repetitive tasks, allowing workers to focus on areas that generate greater added value.

A new milestone in the industry

Always eager to innovate, Rollomatic has set a new milestone not only in its history but also in the cutting tool business with the GrindSmart®830XW, the first and unique concept in the tool grinding industry which integrates the innovative combination of hydrostatic technology and linear motors. It is impressive not only on paper but also in practice, as proved by the positive feedback from users who typically mention that surface finishes and cutting edges are of a quality superior to market standards.

Unlimited applications with the new laser machining

Rollomatic has also decided to invest in laser technologies and released the LaserSmart 510, which provides advanced machining processes for superhard material such as PCD, CVD diamond, monocrystalline diamond, natural diamond and PCBN. This highly productive technology delivers outstanding quality and opens up undreamed-of possibilities such as extremely sharp cutting edges with radii of 0.001 mm or less. Unique to the market, programmable defined cutting-edge preparations offer total freedom and flexibility to enhance the cutting tool's performance during machining.

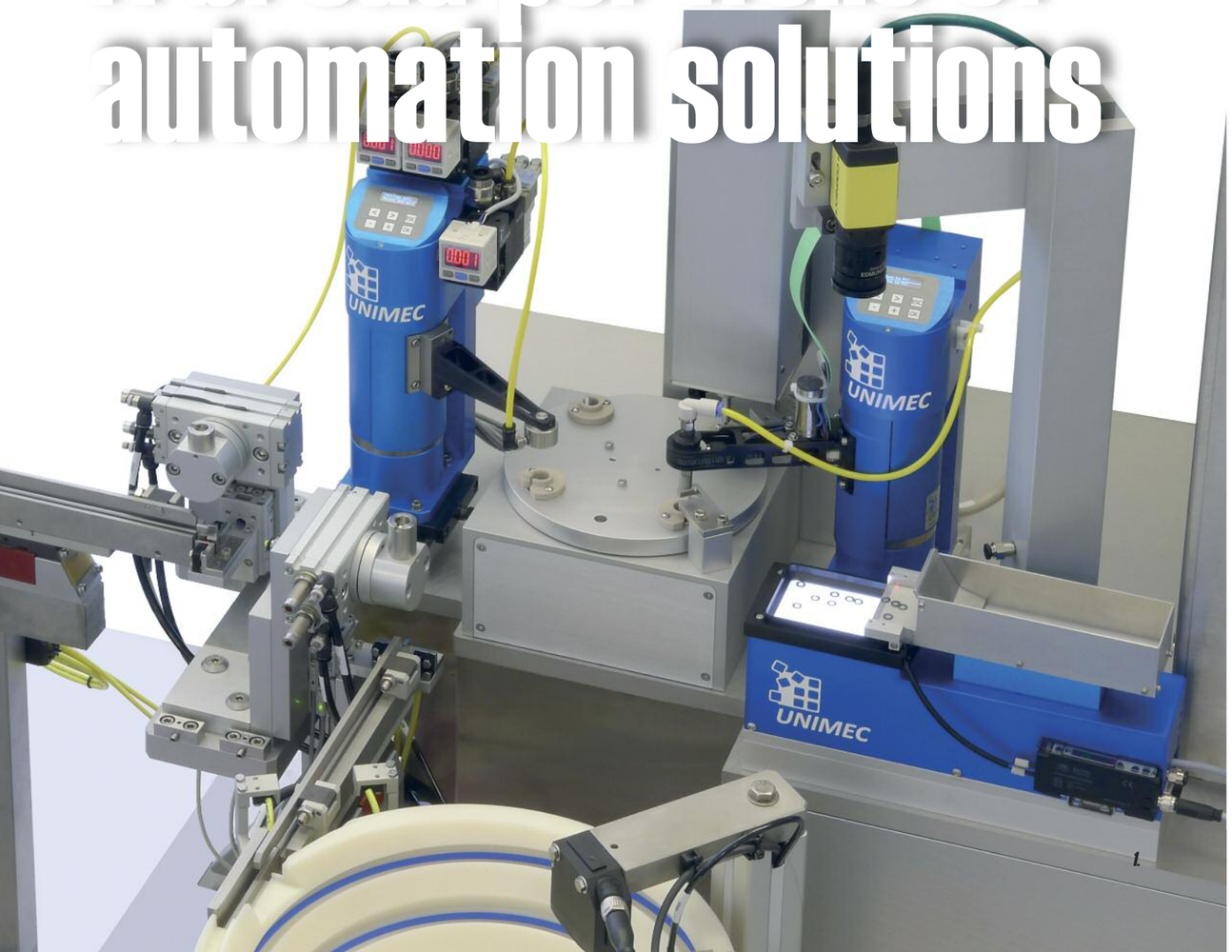
Well trained, optimally operated

Rollomatic pays special attention to customer needs and continuously develops its services to maintain high production capabilities of their machines. It understands the importance of having a highly qualified team dedicated to its clients around the world. The company is currently setting up a structured academy system called The Rollomatic Learning Center, which will offer numerous courses conducted by highly qualified, multilingual experts. The courses will cover everything from grinding and maintenance to lean production, laser technology and robotics.

www.rollomatic.ch

Unimec SA, a swiss manufacture based in La Chaux-de-Fonds, offers various technological solutions for assembly, welding, sorting, components feeding and also dynamic measuring and ageing equipment. These products are especially adapted for implementation in the fields of MedTech, Watchmaking, Avionics, Automobile, Connectors and Microtechnics in general.

A broad portfolio of automation solutions



1.

2.

1. Automatic assembly line for MedTech industry.

2. Watch torque test in 5 heads-version.

3. Watch dial feet welding equipment.

In order to answer more accurately to the market's expectations, Unimec SA can rely on its innovation-oriented structure. All skills and means of production or development are available internally. Experts in mechanics, electronics, software, vision and machining, lean on complete milling, assembly and wiring departments for achieving customer projects on time.

«Our developments are your solutions for tomorrow.»

Emmanuel Remonnay, General Director

Automation

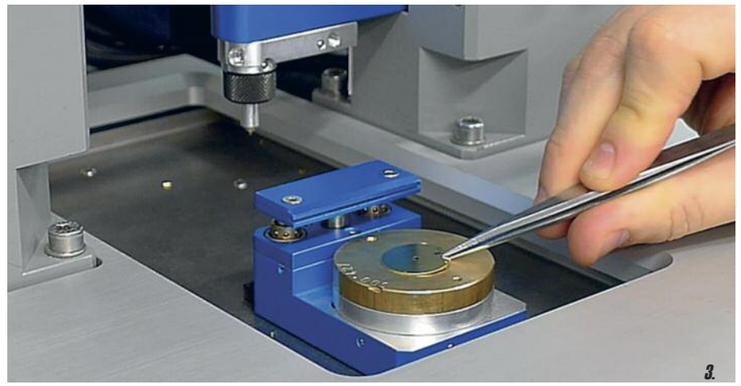
Thanks to more than 40 years of expertise, Unimec SA is now able to present a broad portfolio of automation solutions, whose most renowned product is the so-called Pick & Place robot. The pneumatic range has been supplemented in the last few years by electric robots capable of a positioning accuracy of +/- 5 µm and a working rate of up to 150 cycles/min. The automation portfolio gathers many other units, electric and pneumatic rotary tables with or without indexing function, pressure and vacuum units, flexible feeding systems, motorised linear axis, positioning slides and many more. Innovation in the area of automation means for the firm to rely on its proven expertise but also to invest in new technologies linked to electronics, software and Industry 4.0. But what about the human factor? Unimec SA is convinced that its success strongly depends on the professional growth of its associates and on its ability to listen closely to its customers and users who, through their needs, influence tomorrow's technologies.

Dynamic measuring and ageing machines

Over time and through evolution in watchmaking requirements, Unimec SA has created a department entirely dedicated to qualification and quality control laboratories. The firm offers standard and specific equipment for the dynamic measurement of torque, force, shock, vibration, traction, compression, rotation, etc… This department is also working for thriving sectors, such as the MedTech, Avionics, Automobile or Connectors, all very demanding in regards of products qualification and reliability. Innovation in the area of measuring and ageing machines means for Unimec SA a very close cooperation with its customers, maintaining a strict confidentiality and a permanent technological watch on standards. What is the purpose of such equipment? The industry is consistently reinventing itself. It needs ever more sophisticated products, in short delivery times and responding to high quality requirements. Dynamic test equipment enables the validation of a product in an interactive way, all along its development and a test of its lifespan in acceleration. For the fields involved, such an equipment is a guarantee of success.

Watch dial feet equipment, integrating various forefront technologies, is a good illustration of Unimec SA capabilities for a specific application.

www.unimecsa.ch



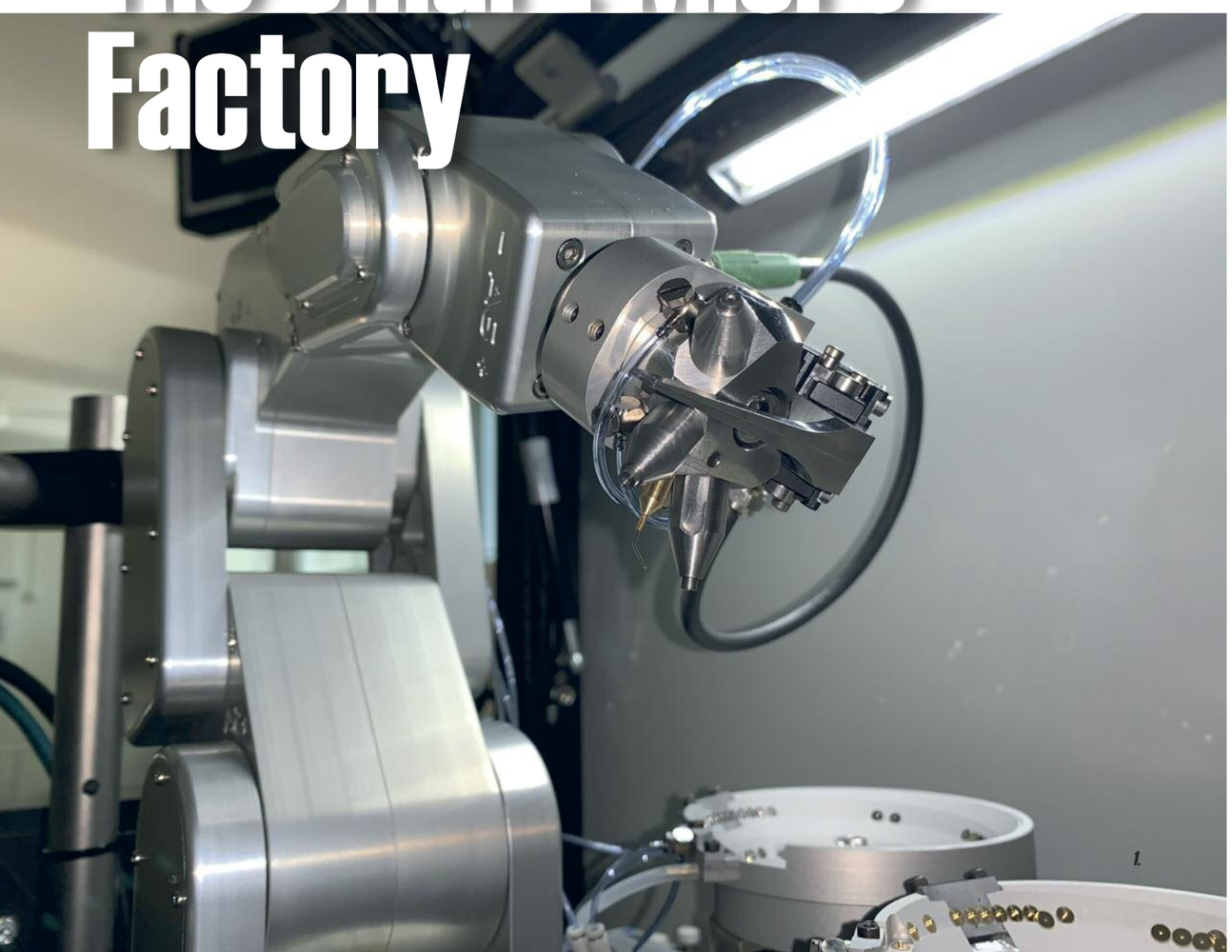
3.

«Reduce the size of machines in order to save money, our concept of today.»

Christophe Taramarcaz, Founder and Director

HoroSys SA, created in 2015 in La Chaux-de-Fonds, manufactures ultra-compact robotic stations and designs miniaturised automatic systems ensuring precision assembling and handling for microtechnical and watchmaking small and medium-sized enterprises (SMEs).

The Smart Micro Factory



1. Compact robotics for watchmaker.

2. Robotic assembly line on a desk.

3. Loading of a grinding machine with vision system.

The Industrial Revolution 4.0, the digitalisation of production, artificial intelligence, modularity and flexibility have become a reality in the field of automation and robotics, and this is only the beginning of the evolution towards intelligent and self-adaptive machines.

It has begun with the need to meet flexible, customised and fast production. But who benefits from this evolution of our tools and machines? Mainly large companies with the resources, both financial and skilled labour, with large production volumes, short payback times and a long-term vision of their market. They are also always very receptive to new technological solutions and are constantly looking for productivity and quality gains.

Unfortunately, the large majority of SMEs are struggling to equip themselves with robotic technology despite their interest and need to increase their productivity. Because of their low short-term investment capacity, their fear of lacking competent resources and sometimes an unsuitable infrastructure, they simply cannot invest in customised automatic equipment, which is very costly to develop, or in robots requiring skills that are unfortunately difficult to obtain.

HoroSys' team of engineers works in the wake of Industry 4.0 precisely to meet SMEs' needs to provide efficient, compact but above all simple and inexpensive automation solutions.

The basic idea for all the developments is to rethink the way of producing: is it necessary to have an 800 kg equipment, consuming 3 kilowatts to machine, assemble, measure or control components weighing only a few grams? The natural answer is miniaturisation. Another key point is ease of use. Today we have become accustomed to not necessitating an instruction manual, for example with our smartphones, thus being able to quickly choose a new application. In our private lives we've seamlessly reoriented our centres of interest around everyday technological objects, why not so with production machines?

HoroSys' Smart Micro Factory (SMF) range of automatic equipment offers the possibility of integrating miniature «bricks», by function, by trade, always with the same mechanical, software and intelligent automatic components base. This allows the production line to be completely recombined or reconfigured very quickly and with a minimum of effort. Able to adapt easily to a new task, it allows the user complete freedom to adapt to changing needs.

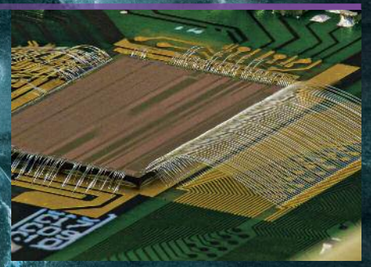
These SMF robotic stations already offer assembling, quality control and handling functions that can be integrated into other existing production facilities. Primarily active for precision operations on microtechnical and watchmaking products, HoroSys offers and integrates the most repeatable (5 microns), compact and easy-to-install robot, the Meca500 from Mecademic in Canada. The strategic partnership with this company since its creation in 2016 in Montreal has made it possible to meet the demand of microtechnology in robotics: precision, simplicity, compactness and controlled cost. It has become a key element of the SMF robotic stations.

In perpetual evolution, the next modular stations will offer washing, surface treatment, additive manufacturing and machining.

HoroSys relies on a network of skills to build this equipment. It is no longer conceivable to do everything alone, to internalise all the necessary trades. Technologies are advancing very rapidly and require countless specialised resources. To create automatic equipment, today we need not only «machine builders» and automation specialists, but also AI specialists, advanced computer engineers in machine learning, deep learning, Big Data scientist, roboticists and many other experts. Collaboration and partnerships between many specialists are the key to the success of each project developed. HoroSys, as an integrator, plays the role of conductor and tester of new technologies.

www.horosys.ch

We just see a few of the myriads of interconnected tiny parts which make nature and our daily life efficient, informed, comfortable. Alike we have just glimpses of how deep thousands of researchers and developers in Western Switzerland contribute with micro & nano technologies to make both local and global worlds smarter: efficient, informed, comfortable.



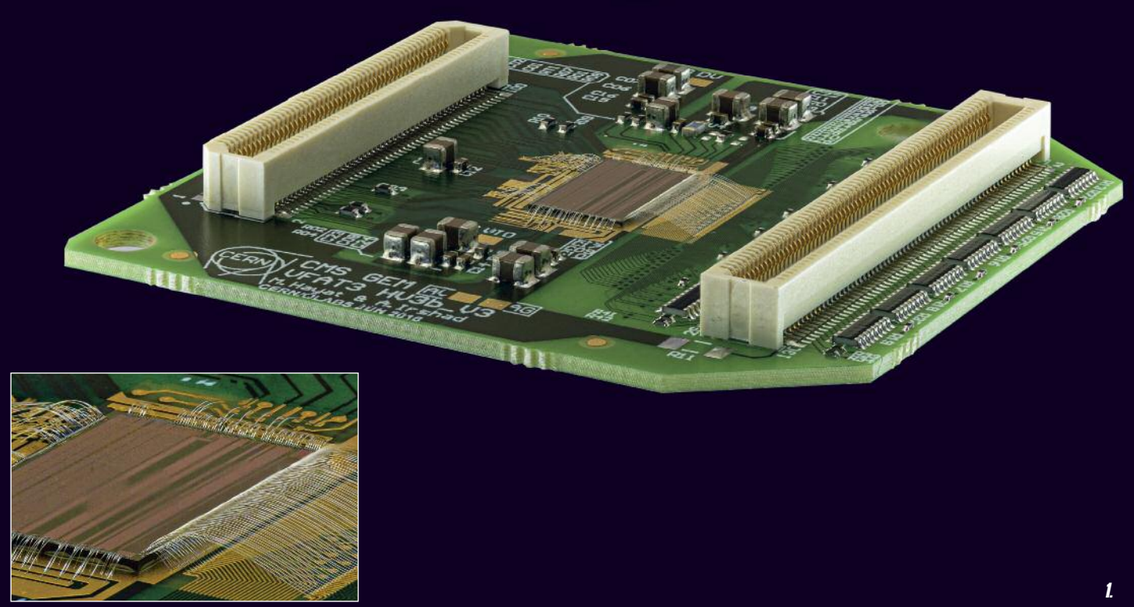
Multi-levels 18 µm wedge bonding

What risks do you accept to take in case of failure of the electronics of your products?

View from an ice cave into Loetschental, Valais

Founded over 30 years ago, Hybrid SA is your specialist in the industrialisation and assembly of microelectronic circuits, from simple to complex products, from low to high component densities. Situated along Lake Neuchâtel, we produce more than 1'000'000 circuits every year.

Inventive assembling of microcircuits with SwissMade precision



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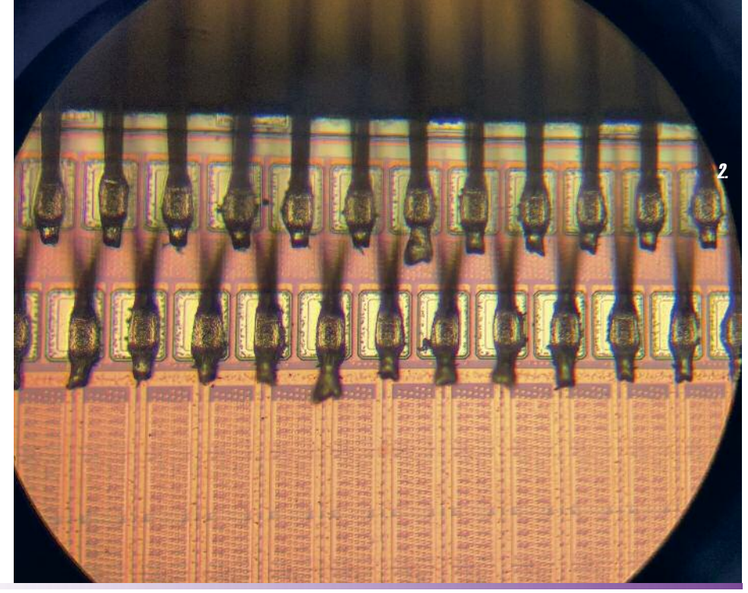


2

1. Wires: Aluminium alloy / Diameter: 18 µm / Number of wires: 460 / Longest wire: 4,5 mm / Height of wires: Max. 800 µm.

2. Bonds Pads Opening: 30 µm x 45 µm / Pitch (space): 55 µm / Space between rows: 40 µm / Zoom: 250x.

The challenge was daunting because the chip was intended and designed to be assembled in a ceramic case with the use of gold wire to connect it (a technology called Ball Bonding). However, for reasons specific to our client, we were asked to mount it on a predetermined printed circuit, technology called Chip On Board (COB). This change in process no longer allowed the use of a golden wire. With a chip thus initially intended for packaging, it was necessary to roll up our sleeves in order to meet the customer's needs.

«The expertise of our employees makes your most complex projects possible.»

Dominique Valantin, Market Development Manager

To achieve this, we had to use an aluminum alloy bonding wire (technology called Wedge Bonding) of **very small diameter** (18 µm, instead of the usual 25 µm). This allowed us to assemble on Bonds Pads Opening of 30 µm x 45 µm, close to the capacity limits of our machines, with a pitch (space) of 55 µm, using three levels of wires. In addition to that, the two rows of wires on the chip, spaced 40 µm apart, were not suitable for aluminum wire technology. Therefore, it was necessary to **create a special tool** to allow the wiring of the second row of wires without damaging the first.

We found ourselves confronted with another problem: the physics of the wires. Due to the small diameter and the length of some - the longest measuring 4.5 mm - the risk of breakage during assembly, as well as the risk of shorting adjacent wires due to their weight, was high. Our engineers were able to remedy these problems by exploring machine parameters and wire shapes.

Everyone's choices and efforts proved effective, as it was possible to produce the desired 5'000 or so parts, while maintaining the high standards of quality demanded by the product.

It is by overcoming such challenges that we have forged in-depth expertise of these processes, which allows us to achieve assemblies that others might refuse.

We live in a world where the presence of microelectronics has become essential. In our role as a subcontractor, our clients come from a variety of fields: watchmaking, mechanical industry, medicine, security, nuclear power and research, to name but a few examples.

We have made the assembly of microelectronic circuits our specialty and are able to achieve the objectives set by the product specifications defined in collaboration with the client. It is necessary to have recourse not only to cutting edge machines but also to a know-how that combines a set of processes we have learned to master in our thirty years of experience, and especially to the expertise of each employee.

The assembly of the product is the most visible part of the chain, but not always the most complex. To be able to assemble a product with more than 200'000 parts with always the same level of quality, it is imperative to have all the processes under control; from understanding the needs of our customers to the shipment of parts, including the design of the printed circuits, the supply of components and the manufacturing. Our system, certified to ISO 9001 and 13485 standards, is the guarantee of the quality of our work.

It is by surmounting difficulties like the one explained above that we grow and accumulate our know-how and is why our high-tech clients return to us repeatedly.

www.hybrid.swiss

CapQua Sàrl is a Swiss company based in Neuchâtel, founded in April 2018. Two years later, it was accredited as an IPC Training Center and proposes its services of trainings, certifications of persons and expertise of special processes for the electronics industry.

A swiss training on IPC standards and certifications

2a.

2b.

3.

Founded in 1957, IPC - Association Connecting Electronics Industries® is an international association of more than 3,000 member companies around the world, including Alcatel, Boeing, Cisco, GE, Huawei, Intel, NASA, Samsung, etc. This association publishes more than 300 international standards that represent the state of the art in electronics, from the design to the repair of electronic boards. And it manages a panel of international person certifications that demonstrate and ensure the competence of the people involved in the processes of electronic assembly production.

These IPC standards and certifications are developed by an ecosystem of companies developing, manufacturing, integrating, repairing electronic assemblies for the aerospace, railway, medical devices, watchmaking, IoT, computer, etc. For decades, companies in this ecosystem have had a staff which is certified «IPC Specialist» to ensure the reliability of their products, control costs and reduce production lead times.

These «IPC Specialist» must renew their certification(s) every two years to maintain their level of competency. This ensures that they are familiar with IPC standards, thus they work according the state of the art and that they are up to date with the latest technical developments. These certifications are carried out, in particular within IPC Training Centers, by certified «IPC Trainers», who also have to renew their trainer qualification every two years.

«Quality is not controlled, it is performed ...when the hand becomes spirit.»

Pierre Rogé,
Founder & Director

For several decades, all over the world and in many European countries, there have been one or several IPC Training Centers per country. However, until April 2020, Switzerland was one of the few European countries without such a center. After two years of activities, investments and thanks to the skills of its founder, CapQua Sàrl obtained the accreditation of IPC Training Center and finally fills this gap in order to maintain highly qualified jobs in Switzerland.

Since July 2019, CapQua Sàrl offers the main IPC certifications. And as soon as possible, it will be possible to pass all IPC certifications in Switzerland. The objective is to support Swiss companies that need to have certified personnel. Firstly, by avoiding that they are forced to send their staff to be certified abroad or that they bring in European trainers. And secondly, by developing a center of excellence in electronics with local skills that can respond quickly to their issues.

1. What risks do you accept to take in case of failure of the electronics of your products?

2. Examples of defects described in IPC-A-610:
a. Nonwetting of the solder joint on the lead
b. Fractured solder connections and lifted land.

3. Replacement of an IC with hot air according to IPC-7711/21.

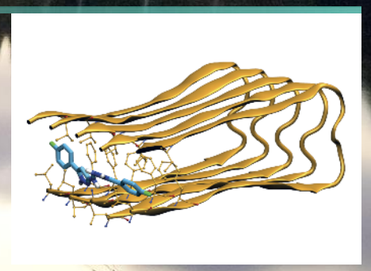
By developing these IPC certifications, CapQua Sàrl wishes to contribute actively to the economic development of Switzerland, in particular by disseminating high level knowledge, by creating all the conditions to guarantee the next generation and a sufficient number of qualified professionals.

And Swiss companies active in sectors where the safety of people is at stake such as medical, aerospace, energy, transport and IoT will have the same advantages as their foreign competitors while benefiting from the insurance offered by these IPC standards and certifications.

www.capqua.ch

With an expert trainer with several IPC certifications, and a network that has a multidisciplinary know-how of more than 50 years in electronics, CapQua Sàrl offers quality consulting for special processes, expertise and qualifications of people according to:
- *IPC-A-600: Acceptability of Printed Boards,*
- *IPC-A-610: Acceptability of Electronic Assemblies,*
- *IPC/WHMA-A-620: Requirements and Acceptance for Cable and Wire Harness Assemblies,*
- *IPC J-STD-001: Requirements for Soldered Electrical and Electronic Assemblies,*
- *IPC-7711/21: Rework, Modification and Repair of Electronic Assemblies.*

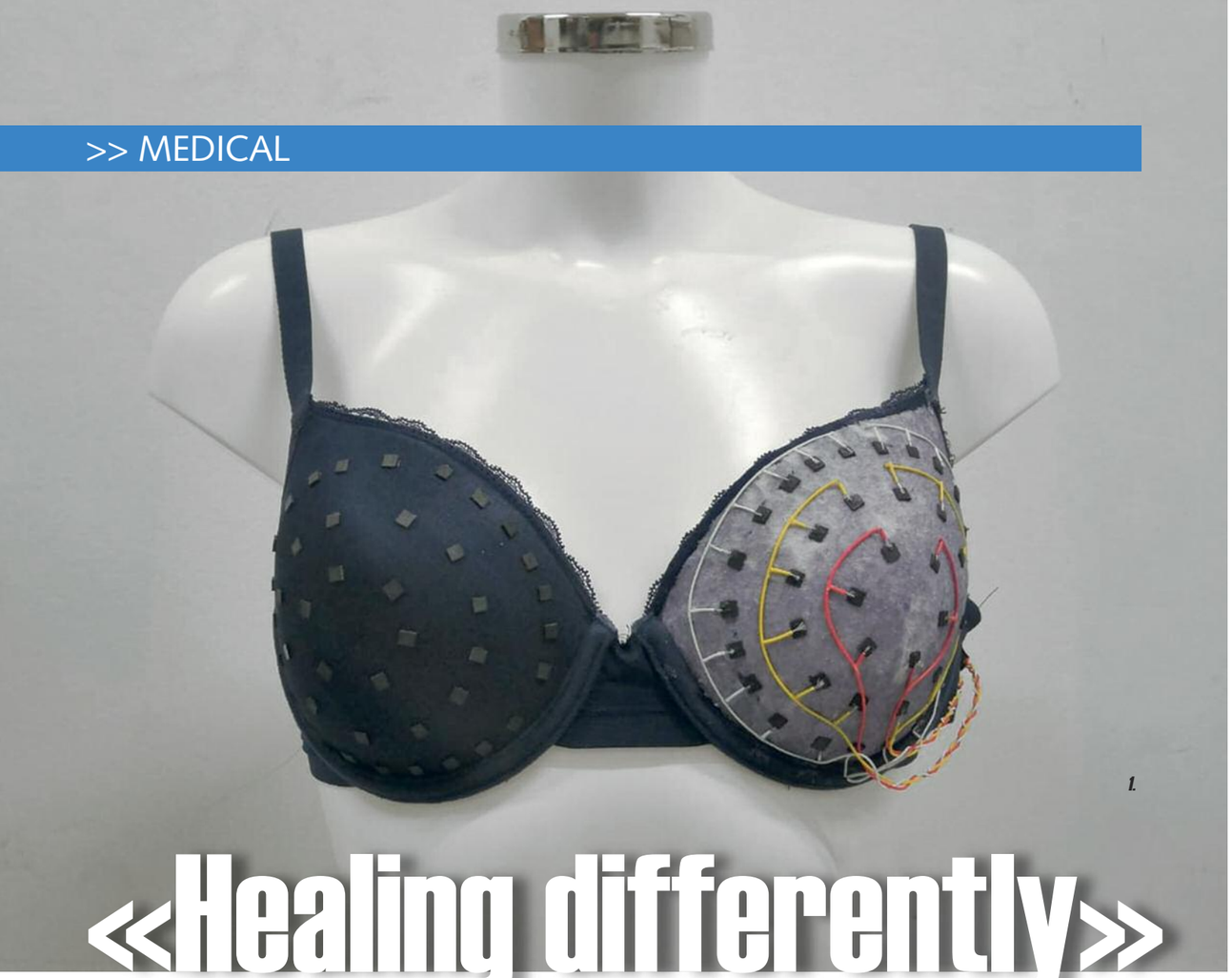
Life is about balance and fine tuning of innumerable, fast, invisible processes. Technologies at the smallest scales associated with digital data processing are tackling the challenge of mastering further and further the «innumerable», the «fast», the «invisible». To help us quietly enjoy a balanced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



The Morphomer™ platform generates small molecules binding specifically to misfolded proteins.

A view of the technology inside the bra using 3D array of ultrasound probes.

Etang de la Gruère, Jura



1.

«Healing differently» - detecting breast cancer at home

IcosaMed, founded in 2019, wants to early detect and actively prevent cancers, especially breast cancer. Positioned as a complementary and synergistic approach with existing solutions, this represents a tremendous hope for public health: early detection, just by wearing personal clothing.

2.

1. A view of the technology inside the bra using 3D array of ultrasound probes.

2. Products portfolio: under the umbrella of the patent, the smartbra is the first of many smart clothing, using the same technology.

3. First prototype (exibited at Medica in Düsseldorf and at the CES in Las Vegas).

Early detection of cancer: that is the aim of the company. Why doing that? It is not only because cancer remains a leading cause of death worldwide: more and more techniques and drugs today can address cancer specifically and treat. The reason lies in early actions: putting all efforts together to early detect and act before cancer starts having large effects. «This is why we are here» says Max Boysset, founder, and CEO of the company.

«Nobody demands, everybody contributes. Far beyond a project and a company goal: this is our way to contribute to people's health.»
Dr. Max Boysset, CEO

«Treating cancer means arriving too late and that could be avoided». If early detected, all other aspects associated with cancer treatment are avoided: pain, anxiety, usual adverse events of drug therapies. This prevent long hospital stays as well. Comfort wise, this is a huge benefit for the patient. IcosaMed wants to early detect cancer, to avoid entering the medical sphere of oncology. This is a total disruptive approach. The technique of ultrasound, a proven technology against cancer, has been chosen for covering echography's and potential higher doses delivery, using the same hardware. For the echography, the migration of this technique from the hospital to a smart clothing has been recognized as a true disruption since the early presentations at Medica and at the CES: no one else had seen that before. The first prototype of the smart bra, having ultrasound probes at the contact of the skin, a printed circuit board, a battery and wireless connected to your smartphone, meet a large interest from people. There is no equivalent in the market today for smart clothing in detection and active prevention of cancers. The patent remains a key aspect: it does address any clothes using ultrasound transducers with the goal of treatment, prevention and detection - that has been published in August 2020. But it really goes beyond that: providing the ability for anybody to monitor cancer prevalence in real time. Technically, this device early detects any further unexpected growth cell using discrete ultrasound probes. With AI and statistical modelling, any suspicious behavior of cells will be analyzed, using 3D imaging. If within two weeks the model confirms a continuous trend, then the app will advice to get a medical examination. Technical partners have been key since day 1: the technical integrator Turck Duotec in Delémont, who built the first prototype and the EPFL, who worked on the skin interface to mimic the impedance gel. «Some technical questions remain open» continues Max Boysset. «However, we are confident to use existing robust techniques to address those». Indeed, the prototyping phase continues, and the delivery of a functional demonstrator is on its way. «Next step will be to insert this second prototype within a bra», Max Boysset adds. The company is now opened to investors: the financial need for putting the product on the market represents 5M CHF. Half of the funds will be used for the technical and industrial aspects while the second half will be dedicated to communication. «This project is so exciting and disruptive; we have the right team and partners and the right pathway to make it concrete». The benefit for health is obvious and the outlook are immense: after the bra, other products are already identified. Underpants will address the sphere monitoring colorectal, bladder, ovarian, testicular, prostate cancer. And a body suit will address lung cancer «We are so excited to provide this device to people: this is a mission that wakes you up a night».

www.icosamed.com

3.

Lécureux became famous in the 1960s after inventing the first electric screwdriver for watchmaking. Since then, the company has custom-designed a range of assembly solutions for the medical devices and microtechnology industries. Its director, Gérard Jeanfavre, discusses the company's development of automated and semi-automated systems for clients who work with small parts.

Specialists in precision assembly systems

1

2

1. eScrew Speed is an electric screwdriver with a wide torque range, from 50 mNm to 250 mNm, along with a positioning accuracy of 2 degrees.

2. A key competence of Lecureux SA is the handling, assembly and control of small or very small components.

For nearly 50 years, Lécureux has been manufacturing precision instruments. Located in Bienne, Switzerland, at the heart of the Swiss watchmaking industry, the company has many watchmakers among its clients. However, it rapidly became apparent that its type of products would suit the medical devices industry too.

«I am proud of my employees, they are committed every day to offer the best to our customers. Especially in these difficult times.»

Gérard Jeanfavre, Director

Its signature product – an electric screwdriver – was invented in the 1960s, and is still what the company is best known for. This screwdriver is used in the assembly of watches as well as in other applications (like medical devices) where precision and exactitude are key.

Since then, Lécureux has expanded its portfolio to include a full range of assembly systems, both fully and partially automated. These include manual screwdrivers, screwdriver controllers, measuring systems and tabletop assembly products. All are tailored towards small – or very small – components. As Gérard Jeanfavre, director of Lécureux, points out, big parts are not the company's domain.
«We work exclusively with small components measuring 50 mm and under, for part manipulation and assembly,» he says. «Our solutions range from a single cell with one robot and some control equipment inside, to a huge assembly line with 50 cells with many robots inside, along with the logistics of all the parts between the cells.» He adds that each product is custom designed, meaning if you have a specific need and don't find what you're looking for on the market, Lécureux will be able to develop it for you.
«Customers will come to us and explain their needs, and then we develop a concept» says Jeanfavre. «We show them our idea for how we could manipulate or assemble the parts, explaining the different processes inside the product and every point that is important for the project. Maybe they say 'Okay, we can go with that', or, 'No, that's wrong; you have to change it'. We make such project reviews at every important step of development.»

After development

Once the development process is completed, the company moves on to production and assembly. «At each step of the assembly process, we ask the customer to come to our company, if possible, to validate the process» Jeanfavre explains. «When the product is finished, we deliver it to the customer's company, where we commission and set up the equipment, and ensure it fits their requirements.»
Over the years, Lécureux has cultivated a strong expertise in mechanical and software engineering, robotics and measurement.
Following a wave of company acquisitions in the 1990s, it diversified its offering and built up skills in many different types of assembly lines. Today, it has a team of 20 people in software development, working across the likes of process systems enterprise (PSE) and vision software, as well as a team of mechanical engineers who can produce precision mechanical components.
The next step for Lécureux will be to grow its business into new markets. Today, it maintains a research network across Europe, with offices in Italy, France, Finland and Germany. It serves the Asian market too, with an office in Shenzhen, China. Jeanfavre now hopes to expand into North and South America, and boost the company's presence across Northern Europe. «We are taking this step by step» he insists.

The company is also looking to expand its product assortment. As the market for conventional assembly lines becomes saturated, Lécureux aims to exceed customer expectations and provide something new. To take just one example, the company is developing a new modular assembly cell that could be used with a range of different parts.
«One cell can produce up to one million pieces a year and, with 15 robots inside the cell, it can do 15 operations at the same time,» says Jeanfavre. «We have one customer in the smart watch industry but it could be dedicated to medical devices too. We have started development of this prototype and it will be available at the end of 2020.»

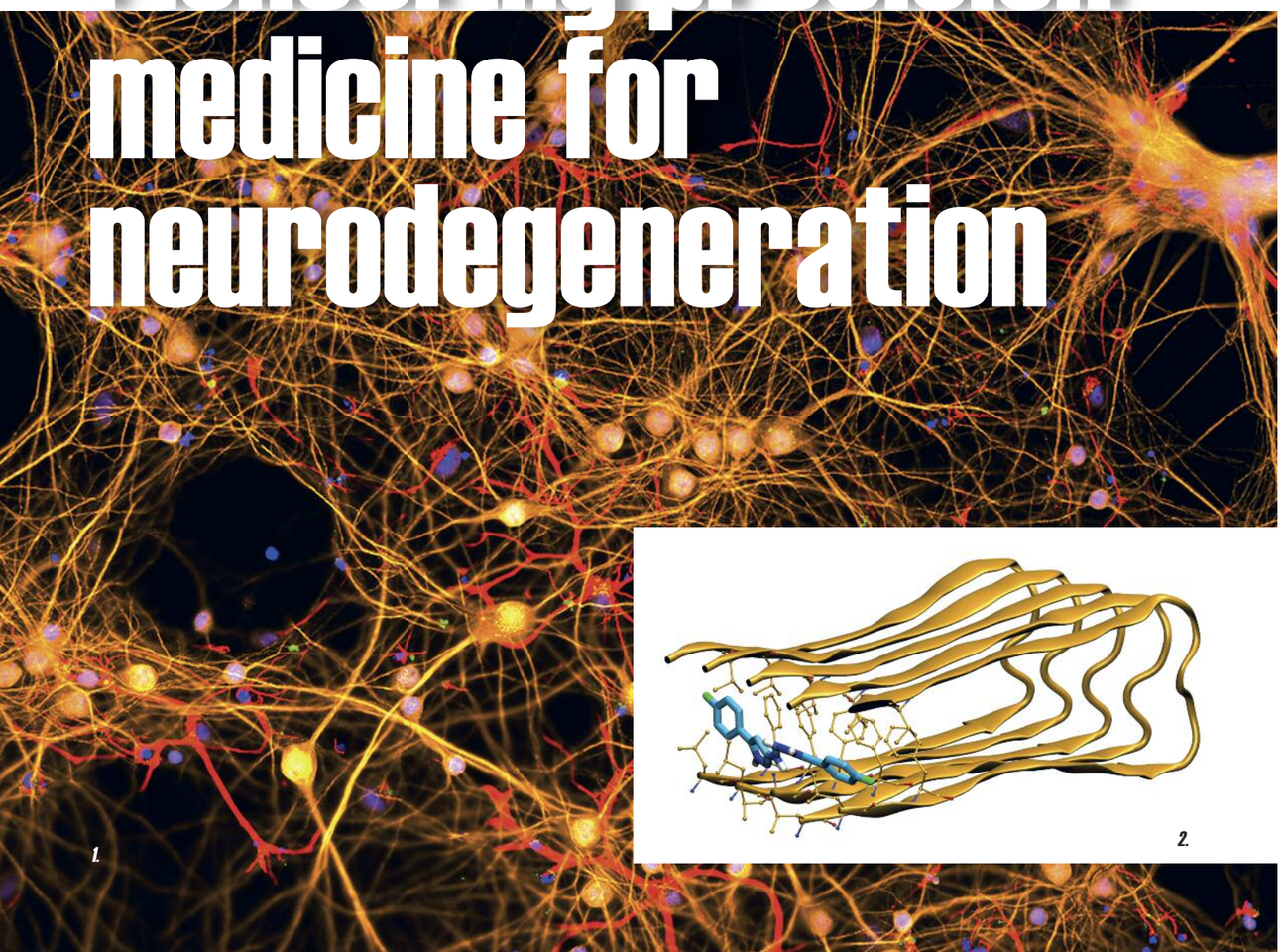
www.lecureux.ch

«From diagnostics to therapeutics: we aim to develop a comprehensive precision medicine approach.»

Andrea Pfeifer, CEO

Worldwide every 3 seconds, a person is diagnosed with dementia and by 2050, cases could triple to 152 million. Founded at the EPFL Innovation Park in 2003, AC Immune SA, a Swiss biotech, is developing diagnostics and therapeutics to address dementia, one of the greatest healthcare challenges.

Pioneering precision medicine for neurodegeneration



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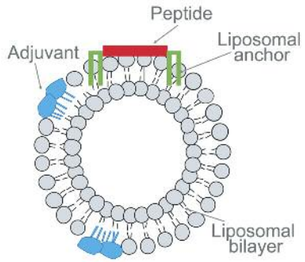
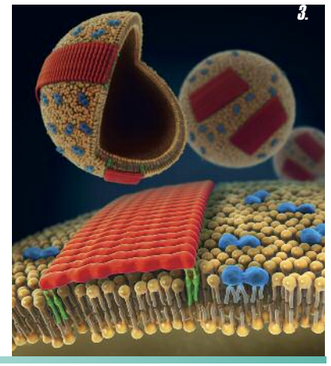




3.

1. Microscopy image showing neurons (yellow) and the pathological forms of the protein alpha-synuclein (green) targeted by AC Immune's antibodies.

2. The Morphomer™ platform generates small molecules binding specifically to misfolded proteins.

3. The SupraAntigen™ platform uses peptide antigens attached to liposomes to create vaccines and antibodies.

Loss of memory and spatial orientation, difficulty in planning and in performing familiar tasks, these are the symptoms that heavily impact the daily activities of the 50 million people living with Alzheimer's disease. Currently, there is no cure for Alzheimer's disease and approved treatments only provide temporary relief from symptoms but do not stop the cognitive decline.

Neurodegeneration is caused by proteins that are present in the healthy brain but have gone awry. When they misfold, their three-dimensional structure is altered which prevents their normal functioning. Now pathological, these proteins form insoluble aggregates and become harmful to neurons, eventually leading to their death.

To cure Alzheimer's disease, several challenging obstacles need to be overcome. First, even if these proteins are toxic to neurons, our immune system does not generate a response against them, because they are not foreign. Second, the difference between the pathological and the normal structure of the protein is small. It comes down to a small difference in its shape, making it difficult for a drug to target it selectively. Third, there is mounting evidence that Alzheimer's disease, like cancer, does not have a single culprit. A variety of proteins can misfold, induce structural changes in other proteins and spread across the brain. Alzheimer's disease is a broad spectrum of overlapping protein disorders. Finally, diagnosis often occurs only when symptoms become obvious, but at this stage, the disease has already been progressing silently for several years and caused irreversible damage.

AC Immune's strategy is driven by a deep understanding of the science of protein misfolding. Using our two technology platforms, SupraAntigen™ and Morphomer™, we intend to develop precision diagnostics and therapeutics to identify and remove those misfolded proteins that drive disease progression. We are convinced that our precision medicine approach, similar to what is now common practice in oncology, could increase the chances of treatment success.

We leverage our platforms to develop biomarkers for earlier diagnosis, which cannot be achieved by only monitoring clinical symptoms. Since these are similar across diseases, analyzing the brains of patients is crucial to select the best treatment. Reliable detection of protein accumulation in specific brain areas allows for better differentiation of diseases.

Depending on the diagnosis, we will need targeted interventions at various stages of disease progression. The use of therapies with unique molecular properties and distinct mechanisms of action will allow intervention at different stages of the disease: removing misfolded protein before it aggregates, preventing spreading of the protein across the brain or promoting disaggregation at later stages. Our pipeline of therapeutic candidates, composed of vaccines, antibodies and small molecules, targets a broad array of pathological proteins, including classical hallmarks of Alzheimer's disease, such as amyloid-beta and Tau, as well as novel targets, such as alpha-synuclein and TDP-43.

The value of our pipeline is validated not only by the strong preclinical and clinical data generated, but also by AC Immune's collaborations with major pharmaceutical companies including Genentech, a member of the Roche group, Eli Lilly and Company and Janssen Pharmaceuticals.

We believe that identification of an individual's molecular drivers of disease and delivery of optimally tailored and timed interventions will allow combinations for treating a broader spectrum of the disease and offer greater efficacy. Differentiating patient populations based on their biomarkers could lead to a better understanding of the disease and accelerate the development of successful combination therapies.

www.acimmune.com

1. The Go-Tryke give an unrivalled access to sport training and therapy to people with reduced mobility.

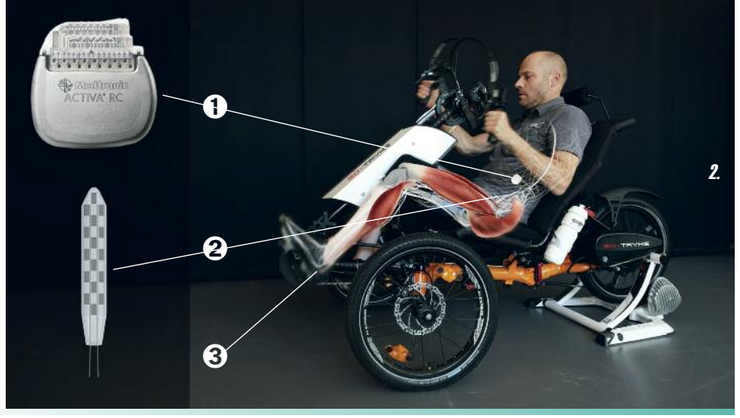
2. IPG, Implantable Pulse Generator (1); Electrode (2); AMU, Angle Measurement Unit (3).

3. BiPedal, measuring device produced between 2018 and 2019 by the HESB Burgdorf. It is used as part of the «TrikeStudy».

GBY develops, produces and sells the Go-Tryke, a three-wheeled bicycle for people with reduced mobility. This device, designed by Sebastian Tobler, himself tetraplegic, leverages physiological movements to a new dimension combining sport and therapy.

Go By Yourself !

1.



2.

Go-Tryke & physiological movement

The Go-Tryke is a «tricycle» with two linked cranksets: one for the hands and the other for the feet. When the hand crankset is operated, the foot crank rotates accordingly, thus respecting the natural coordination movement of the body when walking. Through this applied direction of movement, the Go-Tryke is the only «tricycle» which enables natural coordination of arm and leg movements. This device adapts to humans and not the other way round. Electric assistance in the rear wheel equipped with sensors supports the users' effort, allowing them to reach places otherwise inaccessible. This provides a feeling of freedom!

«It's not for man to adapt to the machine, but quite the opposite!»
Sebastian Tobler, CEO

From concept to completion

The idea came from a paraplegic engineer, Sebastian Tobler, following a mountain bike accident in 2013. After a 9-months rehabilitation at the Swiss Paraplegic Center, he returned home and began an intense training program, reaching up to 37 hours a week in his cellar on different devices. This is where the desire to combine therapy and outdoor sport emerges. The objectives are clear: moving the legs and arms in a physiological manner while making nature accessible through riding on paths and trails. After multiple attempts to find such an opportunity on the market, Sebastian designed the first prototype in 2015 through a thin collaboration with his friends. Initial observations revealed improvements in the coordination, strength and health of people with disabilities who participated in this test. GBY was founded in 2016 and it only took 3 years to produce a first series of 50 Go-Trykes. This device is intended for people with spinal cord injury, multiple sclerosis, stroke or with other motor disabilities. Note that this tricycle can be folded to take it in a car.

«TrikeStudy», collaborative network

The Go-Tryke bridges sport and therapy. To understand the benefits of the movement it offers, GBY launched a project, the TrikeStudy, which brings together scientists from all around. A device equipped with sensors and allowing the arms and legs to be synchronized in different ways has been developed by the University of applied sciences in Burgdorf (HESB, Prof. Kenneth Hunt). It was delivered at the end of 2019 to the University of Lausanne, allowing two studies to emerge: one led by the teams of Dr. Jérôme Barral at UNIL and the team of Prof. Grégoire Courtine at NeuroRestore. In this collaborative project encouraging multiple exchanges and merging different know-hows, the Swiss paraplegic research will launch a qualitative study with 24 patients who will ride the Go-Tryke during 2021-2022.

The future: stimulating invalid muscles on the Go-Tryke

People with spinal cord injury loose full or partial use of their lower limbs. Sebastian Tobler is part of the STIMO study led by Prof. Jocelyne Bloch and Prof. Grégoire Courtine at NeuroRestore, a study that aims to assess the efficacy of spinal epidural electrical stimulation (EES) in combination with neurorehabilitation in people with spinal cord injury. An electrode array is implanted onto the spinal cord delivering electrical stimulation bursts targeting posterior roots of the spinal cord to contract leg muscles via an implantable pulse generator. This technology enabled Sebastian to walk in the laboratory with robotic body-weight support and aid from physiotherapists. In 2018, he suggested to the NeuroRestore team to combine this new technology with the Go-Tryke. A sensor makes it possible to identify the position of the pedals, and thereby the position of the leg which is then used to control stimulation of the specific engaged muscles at the correct timing. NeuroRestore scientists from EPFL and CHUV took up the challenge with great success in 2018 and the results have been published in Nature (Wagner et al., 2018). The Go-Tryke would thus make it possible to promote therapy in a leisure activity outdoors, a solution which is a guarantee of success both from a research and financial point of view.

www.gby.swiss

3.

Created in 1994 by Olivier Schaeren, the company Smile Line is based since 2008 in Saint-Imier (Jura bernois). It is active in the development, manufacturing and marketing of high-end and innovative tools and accessories for both dental laboratories and dental clinics. Smile Line is present via importers and distributors in more than 70 countries and its exports represent 99% of the turnover.

High-end exclusive tools for dentistry

1

2

1. Smile Line designs exclusive instruments of the highest quality with a high emotional value that earned the company the prestigious Red Dot Design Award.

2. Smile Line's education center for the organization of hands-ons and workshops.

Dental technology is a field of activity that is quite unknown to the general public however this is an amazing and very exciting sector that combines the use of advanced materials and technologies. A dental prosthesis must combine at the same time a high level of precision, mechanics & function, and ideally a high level of aesthetics in order to integrate perfectly in a natural environment: a beautiful smile is a wonderful gift, every day!

«The future is not what is going to happen to us but what we are going to do.»

Olivier Schaeren, CEO and founder. He identifies himself with French philosopher Henri Bergson's words.

It is the development of a very innovative product (a device allowing dental porcelain powders to keep their moisture) that motivated the creation of the company more than 25 years ago. At its launch the product immediately met an amazing success on the international markets. Shortly after the start of the company, Le Nouveau Quotidien, Swissair and Carlson Wagonlit Travel organized the B.E.S.T. trophy (best export strategy trophy). The contest was adressed to all the PME in the French speaking part of Switzerland. Smile Line was very proud to win first prize ahead of dozens of participants.

Since then, Smile Line has been cooperating with the best specialists in the world for developing the adapted tools, for proposing new techniques that allow the dental technician to work more easily, faster and with better ergonomics.

With time, Smile Line could profile itself as the world leader in the segment of high-end and exclusive tools and accessories, setting at the same time the pace and a style unknown until then... The brand's philosophy is vehiculed obviously by the quality of the products that can be considered the best ambassadors but also through high-end catalogues and digital medias that are in a total harmony with the product itself.

In 2008, Smile Line won a Red Dot Design Award with its line «Instrument by Smile Line» designed in-house. That was a huge pride for who knows that these awards are aspired normally and before all by the professional designers. Later and since then, Smile Line has started a partnership with Lorraine Calabrese, a very talentuous designer with whom a few impressive successes were achieved.

The year 2008 was also a major milestone for Smile Line, moving into its own premises, built in the Zone Industrielle de la Clef in Saint-Imier. This was probably the necessary step for closing the circle and offering a total coherence, together with the innovative and exclusive products and the highly emotion charged brand image and sales supports.

Last but not least, a few years later and because of the need of more space both for working places and warehouse area, Smile Line extended the surface of the premises, almost doubling it. That was the opportunity for making a dream come true: the creation of a large, modern, high-tech education center. Today, Smile Line's education center allows for the organization of hands-ons and workshops with famous international lecturers and opinion leaders, but also serves for welcoming the sales forces of the dealers, travelling to Switzerland for product training and education purposes.

While for years Smile Line has only been focusing on developments for the technical side of the dentistry (dental laboratories), a few years ago Smile Line could open the door of dental clinics thanks to developments with the leaders of the world's most famous community of clinicians.

In a very competitive and fast moving market, Smile Line has met a constant growth thanks to a continuously increasing portofolio.

www.smileline.ch

Nature has finely designed so many materials to serve the huge diversity of forms and ways of Life. Still, engineers in Western Switzerland go ahead with passion to invent innovative materials at the micro & nanoscales for applications that reach into every part of society.

Evolution of sapphire growth

Installation of the 3D concrete printing robot

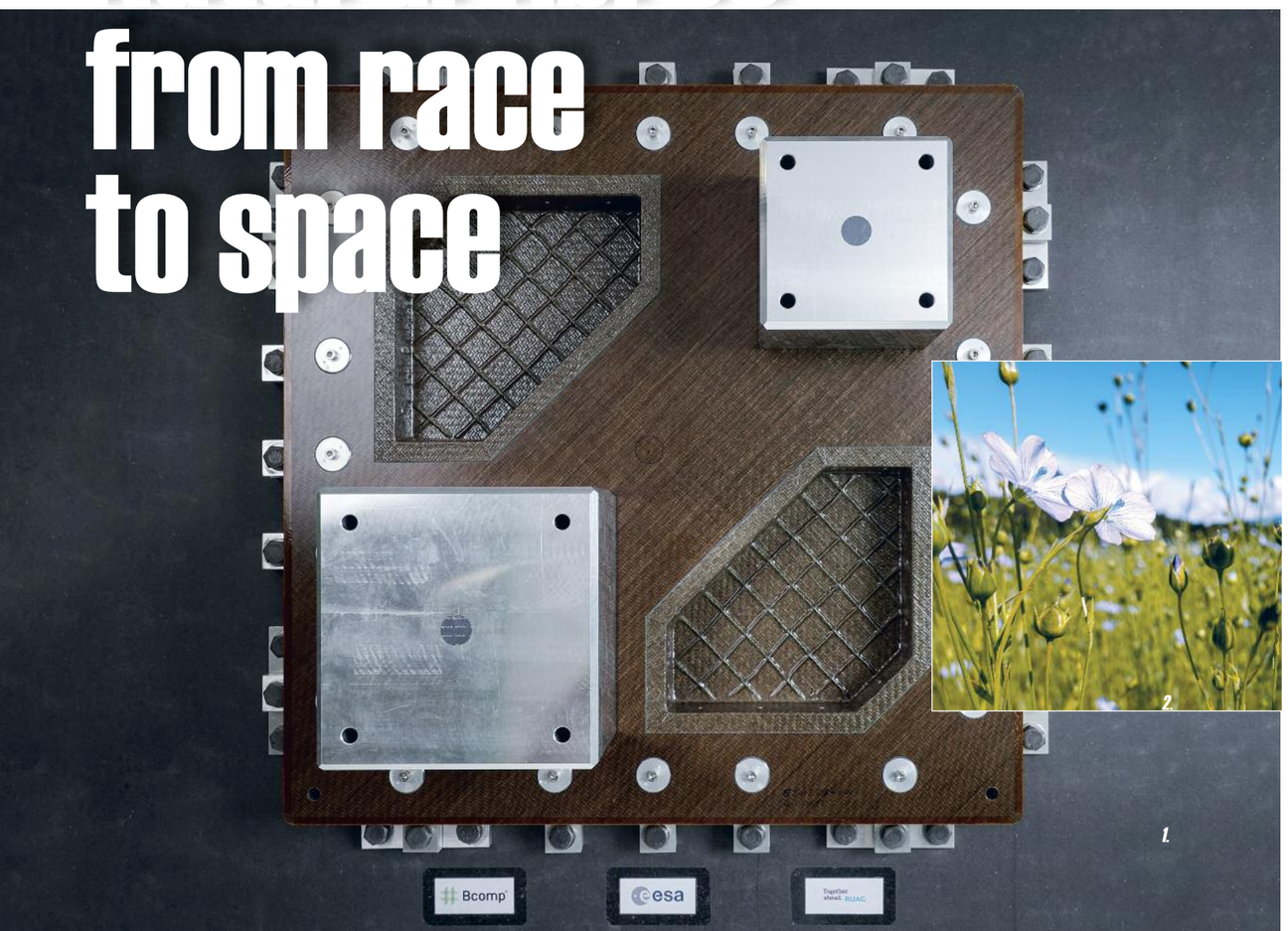
City of Geneva from the Mont Salève

«Lightweighting plays a key role in mobility. We deliver the technologies to do it sustainably.»

Julien Rion,
CTO Bcomp Ltd.

Does it need to be carbon fibre?
Satellite panels, super-yachts, Formula 1 cars – natural fibres suddenly are a viable alternative for what used to be home turf of carbon fibres. Thanks to a revolutionary Swiss technology, flax fibres can now match and outperform carbon fibres.

Natural fibres – from race to space



A true start-up story
The company started as a true garage start-up. The founders, PhDs from the École Polytechnique Fédérale de Lausanne, were looking for ways to create lightweight yet highly performing freeride skis. Result: bCores™, the lightest wood core for skis and snowboards, consisting of balsa wood reinforced with flax fibres.

Fascinated by the properties and potential of flax fibres, the founders proceeded to develop novel solutions for sustainable lightweighting. Technical flax fibre fabrics – ampliTex™ – were quickly adopted by the fast-moving sports industry for surfboards, skis and snowboards and even bike frames. Looking beyond the sports market quickly revealed the significant potential impact in larger markets like the mobility sector.

A game-changing technology
A real step change occurred with the development of the award winning powerRibs™ technology. Inspired by the veins on the back of leaves, powerRibs™ create a 3D grid structure on one side of a thin walled shell element; maximising the stiffness to weight ratio. Thanks to powerRibs™, natural fibres can match the performance of monolithic carbon fibres while adding significant advantages.

Vibration damping is increased by up to 250% and safety aspects are vastly improved as the grid structure prevents shattering and has a blunt fracture behaviour. Not least, Bcomp's technologies enable a 75% lower CO_2 footprint cradle-to-gate, do not require production consumables and can be used for thermal energy recovery at end of life, while saving up to 30% cost compared to a pure carbon fibre construction.

Development platform for sustainable technologies
Striving for maximal impact, Bcomp targets the mobility sector where weight reductions are notoriously important. Motorsports were a logical first step: with short time to market, the racing world acts as a technology platform for OEMs where innovative solutions are developed and tested at an extremely high pace. Facing a global climate crisis, developing sustainable technologies has become a key topic to justify the existence of motorsports – enabling technology transfer to road cars and thus a positive impact.

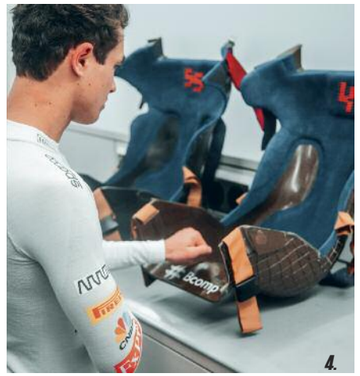
Bcomp collaborates with leading players, most recently with McLaren F1, who just developed the first F1 seat with natural fibres and powerRibs™ – bringing flax fibres to the pinnacle of motorsports.

Road cars, electric trucks, luxury yachts and satellite panels
The potential for sustainable lightweighting technologies is immense and the versatility of ampliTex™ and powerRibs™ allows them to be used in an endless number of applications. In automotive interior panels, powerRibs™ help to cut weight by up to 40% and reduce plastic by up to 70%, thus enabling cars to reduce their eco-footprint and increase energy efficiency.

The Swedish electric performance car brand Polestar (jointly owned by Volvo Cars Group and Geely) launched the Polestar Precept in spring 2020, mounted with a full natural fibre interior. Electric trucks and innovative last mile delivery vehicles are being built with natural fibre bodywork while ampliTex™ technical fabrics are simultaneously conquering oceans in the form of hulls and structural components of the next generation of luxury yachts with market leaders such as Baltic Yachts.

Pushing boundaries even further, Bcomp developed the world's first natural fibre reinforced satellite panel together with the European Space Agency (ESA) proving that natural fibres really go from race to space.

www.bcomp.ch



1. Natural fibre reinforced satellite panel.

2. Flax is locally grown in Europe.

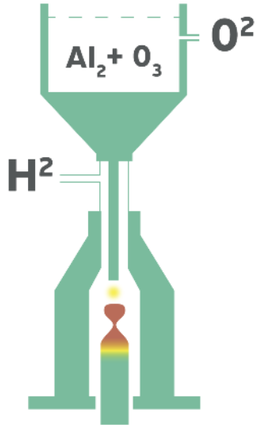
3. B-side of bodywork with ampliTex™ and powerRibs™.

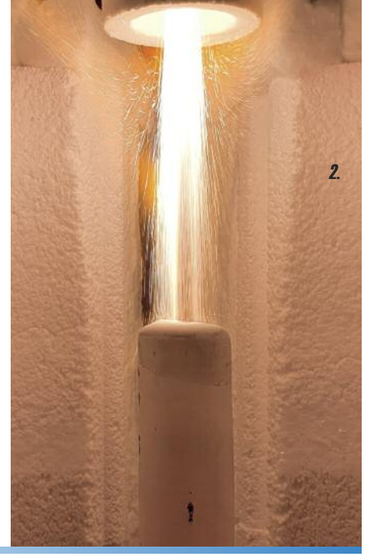
4. F1's first natural fibre seat developed by McLaren Racing and Bcomp.

Based in the canton of Jura, Timsaph SA has taken up the challenge of rethinking the manufacture of sapphire raw material by developing its own machines and processes. Currently, Timsaph is producing and selling Swissmade sapphire for the watch industry, as well as for mechanical and optical applications.

Swissmade sapphires are forever

1.





2.

1. Evolution of sapphire growth.

2. Verneuil process. Sapphire fusions up to 2000 °C, the sapphire is growing drop by drop.

After 25 years of activity in machining and polishing sapphire watch components, the company Sébal SA has gained recognised expertise in this sector. Mindful to promote local skills and 100% Swissmade products, Sébastien Sangsue, CEO of the company, wanted to take up the challenge of manufacturing the sapphire raw material. Indeed, the quantity of sapphire material produced in Switzerland is minimal compared to the needs of the Swiss watch industry, which is mainly supplied in Asia.

«From an ancestral process reviewed with high technology, we expand the market by offering 100% swissmade sapphire.»

Damien Schaffter, site manager

Timsaph's Development

Therefore, Timsaph SA was born in 2015. The goal? To optimize the Verneuil flame melting process, more than one century old, and create synthetic sapphire with today's technologies.

This bold R&D project has led to design a prototype machine with cutting-edge technology allowing ultra-fine adjustments in gas diffusion and alumina powder distribution.

The process and the design of new specific tools led to quickly create the first sapphire part compliant with the watch industry specifications.

Following the research phase, bigger industrial melting machines were built and the environment was adapted taking into consideration the constraints in terms of heat and safety required for such a type of production.

Timsaph's rapid growth allows today to satisfy the biggest watch brands by delivering high quality Swiss-made products and securing their supplies.

With a spirit of permanent innovation, Timsaph is getting ready to revolutionise today's market by developing radically exclusive products.

Process and requirements

The whole process requires a complete mastery of a large number of internal parameters related to the exclusive and sophisticated machines, but also the inherent conditions of the environment. This mastery can be supported by scientific approaches but above all requires good experience for which no training course exists.

Customer demands in terms of internal quality exclude any crystallization, pollution or cracking default of the material as well as the most regular geometry possible. This makes the process particularly demanding and requires a sapphire growth under optimal and adequate conditions.

Timsaph has developed all the associated means of production and control, allowing industrial optimization. This makes adaptations and improvements to the quality level agile.

www.timsaph.ch

Characteristics of sapphire

Sapphire is a monocrystalline structure made of aluminium oxide (Al_2O_3), the hardest material in the world after diamond.

Due to its multiple properties of resistance, hardness and transparency, sapphire is suitable for many applications in the watch industry, but also in the manufacturing of tools or the optical industry.

Verneuil process

The production by Timsaph is using a technique based on the industrial process called «Verneuil». This kind of process allows to produce sapphire rods with a diameter of 22 mm to 45 mm and a length of approx. 120 mm. sapphire is growing drop by drop from alumina powder melted by thermal energy using a torch fed with hydrogen and oxygen at a temperature above 2050 °C. The growth of the sapphire rod in insulated furnace takes several hours.

After the production, a cooling time of many hours must be observed and after that, the parts are removed from the furnaces. The internal quality of the sapphire rods is inspected with a laser that highlights impurities and structural defect of the material.

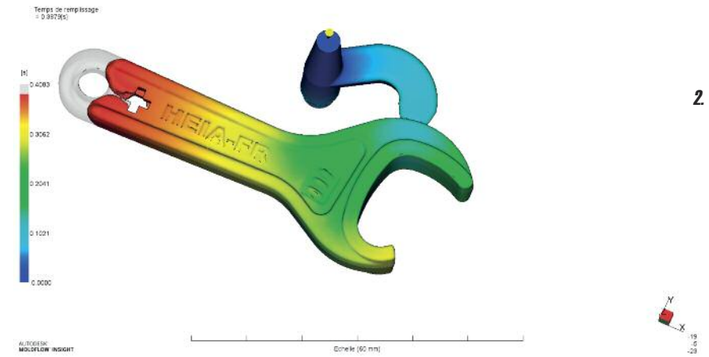
Once checked, the brittle sapphire rod must undergo one more operation : the annealing process. The part is put in a furnace that reaches over 1800 °C. The process lasts several days. After that, the sapphire achieves the required properties, it is really strong and ready to be machined.

«Continuous product and process innovations is the key to face the future market challenges.»

Prof. Dipl.-Ing. Bruno Bürgisser, professor for Plastics Engineering at the HEIA-FR, member of HES-SO, Director of the iRAP-Institute

The Institute for Applied Plastics Research (iRAP) in Fribourg disposes of the specific know-how and equipment in the field of Ceramic Injection Molding (CIM) to support industrial partners in the development of innovative products and solutions.

Ceramic Injection Molding (CIM) for high-end applications



2

The Institute for Applied Plastics Research (iRAP) is attached to the School of Engineering at Fribourg (HEIA-FR), member of the University of Applied Sciences and Arts of Western Switzerland (HES-SO). iRAP institute pursues the goal of developing innovative and economical products and processes in collaboration with industrial partners. The institute offers core competencies in the fields of plastic product development, injection molding, micro and nanostructures, compounding and high added value materials such as magnetic or electrically conductive plastic compounds. In addition, the institute disposes of key competencies in the field of Ceramic Injection Molding (CIM).

Ceramic Injection Molding (CIM) is a net-shaping process which enables the large-scale production of complex-shaped components for diverse industrial applications. This technology combines the advantages of the economical plastics injection molding process and the interesting physical properties of ceramics. The injected feedstock is a compound of a polymer matrix and ceramic powders such as alumina (Al_2O_3), zirconia (ZrO_2) or silicon nitride (Si_3N_4). After injection molding, to take of the polymer matrix and densify the part, the product is placed in ovens for the debinding process and sintering. The end product is composed of pure ceramics and therefore offers unique properties in terms of mechanical stiffness and wear resistance. This makes the parts suitable for applications under extreme conditions like high temperatures, corrosive atmospheres, abrasive conditions and high mechanical stresses. Furthermore, the excellent biocompatibility and the good resistance to sterilization makes ceramic parts interesting for applications in the medical sector.

As explained above, CIM is a complex multi-stage process. For achieving high and stable component quality, all process steps must be fully mastered.

In recent years, iRAP has carried out many projects in the field of Ceramic Injection Molding. These projects focused for example on the production of complex internal geometries that are difficult to demould. Figures 1 and 3 show the development of innovative products by combining CIM and overmolding technology which allows for assembling two different parts. Furthermore, we aimed at exploiting the achievable limits of microstructure replications applying CIM technology, the increase of mechanical properties and density of injected ceramic parts and the impact of the different processing parameters on the part quality and process stability.

3

1. Ejection of the demonstrator part showing the feasibility for integrating a logo to a CIM part through overmolding.

2. Numerical simulation of the mold filling during the injection process of a ceramic feedstock.

3. The four basic steps of the CIM process: feedstock preparation, injection molding (green part), debinding (brown part) and sintering (sintered part). In addition, the part integrates a logo by overmolding.

4. Close-up showing the precision for integrating a logo to a CIM part through overmolding.

Today, the machining of an injection mold for industrial ceramic injection molding is very time-consuming and expensive. During a specific industrial project, iRAP has evaluated possible ways to reduce both by rapid tooling. A solution has been developed in which prototypes of injected ceramic parts can be produced within only 2 weeks with a high reduction of tooling costs.

Furthermore, in the context of industrial projects, the iRAP has also built up specific knowledge and expertise in numerical simulation (Figure 2) and has acquired state-of-the-art CIM equipment. The iRAP institute is able to carry out the product or process development and accompany the industrialization of the product on the site of the industrial partner. Finally, iRAP works currently with some industrial partners to develop new high-end applications, such as instruments, tools and implants for the Medical sector.

http://irap.heia-fr.ch

Cost pressure, lack of productivity, resource efficiency and climate protection are issues the industry has to deal with. Concrete is the most widely used substance on earth after water and this consumption produces a significant carbon footprint. With the rising need in urbanization expansion for its infrastructure in economic and social services, the mechanical performance, durability and affordability of concrete make it the most versatile and preferred material for the construction of infrastructures. To remedy all these challenges, the only solution to tackle the growing demand is to find practical solution through digital technologies and automation to build in a more efficient and sustainable way.

The construction industry is facing major challenges

1. Detail of a curved retaining wall element.

2. Installation of the 3D concrete printing robot at a commercial partner's site, Matériaux Sabag in Delémont, Jura.

3. Schematic view of the Mobbot printhead.

Annoying delays and cost overruns at construction sites are a thing of the past. The Fribourg-based start-up MOBBOT, which develops and operates automated robotic 3D concrete printing platforms, shows that there is another way. Compared to the traditional method, where concrete is mixed and cast on site, and a ready-to-use product is normally delivered within two to three days, MOBBOT technology allows the same element to be produced within just one hour. Today the company focuses the application on utility products such as energy, telecom, water chambers and manholes. Other benefits for the customers are that the technology enables to produce watertight elements and diminish the amount of transport of material on-site.

«Our 3D printing solutions bridge digital models with real world of construction.»

Agnès Petit, Founder and CEO

State-of-the-art 3D printing

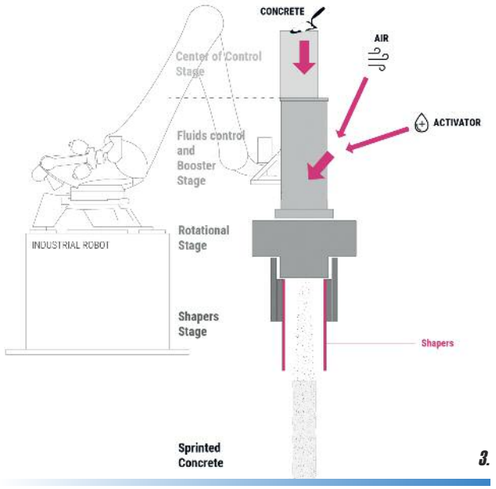
The 3D printing technology using sprayed concrete («sprinting») developed and patented by MOBBOT, uses an industrial robot to construct three-dimensional structures that comply with industry standards and best of all, does not require custom molds. The system was designed to manufacture large parts, all in record time, with project modifications possible up to the last minute. The use of sprayed concrete enables to avoid cost joints between concrete layers and facilitates the integration of passive reinforcement. The know-how of the start-up lies in a multivariable process automation, robot path planning and the aerodynamic of sprayed concrete. The innovation allows customs-made concrete elements of 2 tons to be printed within 20 minutes without the use of formwork.

Another important advantage of this manufacturing process is its low carbon footprint. In fact, it's up to 30% lower than that of on-site production. The technology makes it possible to use conventional concrete that emits up to 30 percent less CO_2 emissions per MPa than with standard methods while using cast-in-place method. To sum up, this type of 3D concrete printing has proven to be particularly sustainable and suitable for infrastructure projects.

Shaping the future

With a solid track-record of direct sales, where MOBBOT has delivered concrete elements for diverse infrastructure-related projects, the start-up is now entering a new phase with a major collaboration with Matériaux Sabag based in Delémont. This concrete manufacturer in the Jura region becomes the first partner to deploy MOBBOT's system in Switzerland and together, the two joint forces are commercializing 3D printed concrete elements. A look into the future shows that digital fabrication using sprayed concrete will be used in a wider field than today.

www.themobbot.com



Endodontics is a discipline driven by the need to remove residual debris, bacteria and biofilm invisible to the naked eye. IrriFlex® penetrates the root canals of the teeth effortlessly, at the cost of a roaring technological achievement in the world of plastic injection moulding.

Injecting an idea into reality

1. IrriFlex® Flexible endodontic needle.

2. IrriFlex® Root canal irrigation.

The history of IrriFlex® is the result of the passion of a handful of specialists who have been able to look beyond their current practice to reach beyond the knowledge they have acquired and open up to revisit the fundamentals of their respective professions. From European clinicians specialising in root canal treatment, to development engineers in companies in French-speaking Switzerland, via the university circles of the Jura and Swiss innovation support organisations, it is the spirit of initiative relentlessly fuelled by the «Innovation» division of the inseparable «Cemiplast SA, in Saint-Imier/BE – Produits Dentaires SA, in Vevey/VD» duo that has succeeded in bringing together the clinical, technical, regulatory and financial players to create a «game-changer» in the world of dentistry and more specifically modern endodontics. Endodontics is the treatment of infected tooth canals.

A hugely collective challenge

Confronted with the smallness of the operating site, the control of decontamination is sensitive in this discipline. A device capable of penetrating to the bottom of root canals is a necessity that has found IrriFlex® on its path.

Eight years of development were required for this revolutionary irrigation needle to meet the criteria for use by dentists, while at the same time ensuring an industrial production capacity able to meet the demand. The world of medical devices - governed by increasingly stringent regulatory requirements, with the entry into force of the Medical Device Regulation (MDR) on May 26, 2021 in particular - requires risk management to be integrated from the very first ideas toward any future product. Moving forward in the development of such a product by surrounding oneself with specialists of all kinds is a challenge that owes its coherence to the overall proficiency generated by the communication skills of the internal team in charge of the project. This adventure bringing together clinicians, engineering academics, moldmakers, materials specialists, injectors, integrators, ultrasound welding professionals, clean room designers, extraordinary bar turners, electro-erosion giants in the world of the infinitely small, has shown how much the human being is at the heart of entrepreneurial success. The respective capability to listen and the enthusiasm propagated by the constant investment of a group of motivated players capable of pushing back limits have not only given rise to an exceptional product, but also to outstanding technological know-how.

«To welcome and to tell are two essential elements to convert an idea into reality.»

David Brendlen, Innovation Manager

Intellectual property and patents worldwide being significant cost centers for SMEs in Switzerland, we are proud of having set up a product-process combination capable of being ahead of the state of the art recognized by the dental profession, with a production tool in line with the Swiss know-how, combining precision and innovation in the industrial field of plastic injection moulding.

Information on the product:
www.pd-irriflex.com
Information on the injection capabilities of thermoplastics: www.cemiplast.ch.

Edge AI from Quality Control to Smart Sensors

Siemens-MindSphere transforms data into knowledge. And knowledge into business success.

Many products presented in this current issue of Micronarc Magazine could have found a place in this section focused on «Digital»...The arbitrary selection you will discover in the next pages offers an overview of the expertise available in the innovative and dynamic field of swiss microtechnique related to the digital world. Implementation of digital solutions and services is seen in many aspects of the daily life of people in the 21st century throughout the world; data acquisition and processing, often supported by AI, are the backbone of most of the new products encountered today. Switzerland is currently writing the next chapter of its technical industrial history. It is not surprising... after all, the 21st century is the golden age for navigation of numerical data.

When navigation was dealing with seas, ships and a race for on-board determination of longitude, swiss ingenious pioneers were already active in the development of innovative portable instruments that allowed to keep track of time at sea, a key parameter to calculate the longitude. And incidentally, they were placing the ground stones for an industry that became the cliché of a swiss technical product… The miniaturized mechanical systems handcrafted in the 18th century developed into precise, reliable and magnificent watch products that are associated throughout the world with Switzerland, second only to the Matterhorn...

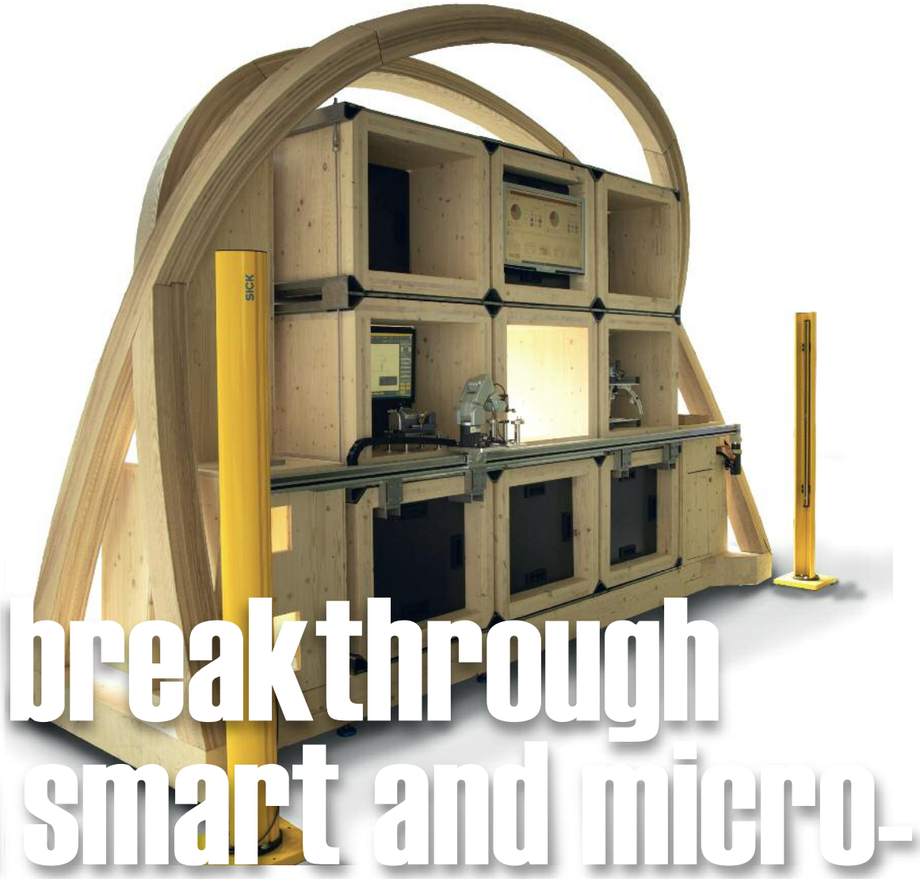
Fabienne Marquis Weible
Ingénieure EPFL,
Dr. ès sciences
Directrice de l'ASRH
(Association Suisse pour la Recherche Horlogère)

Expertise develops with passing generations and the race is no longer on marine navigation. Today's world deals with navigation of data, and as back then, precise determination of time and position is crucial. Challenges are now based on GPS and satellites: the 4 Hz tic-tac of a mechanical watch has been replaced by the 10^{15} Hz beat of an atomic clock. And swiss microtechnique is still onboard, with its research centers and companies developing and producing key components.

When our data navigate, we want to know where they are and who has access to them. With its expertise in security related to its well-known tradition in banking, Switzerland has a role to play. Transfer protocols, equipment and services are developed and integrated into products proposed to the market in fields as diverse as manufacturing equipment, production control, smart sensors, data analysis, medical instrumentation or... horology!

More generally, exchange and trade in the digital world need regulation at the global level: base to many international organizations, Switzerland offers, with its stability, neutrality and its cultural aspiration for compromise, a trustful environment to express and discuss diverging interests in search of common solutions for a global digital world.

Let's make it together!



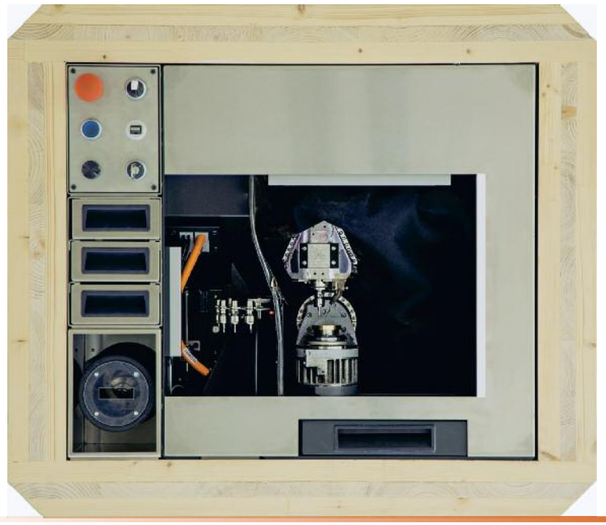
1.

A breakthrough in smart and micro-manufacturing

The Haute Ecole Arc Ingénierie sits in the heart of Switzerland's most industrialised region. It leads applied research projects and trains engineers destined to perpetuate Swiss Made excellence. To stimulate the Swiss microtechnology industry and position it at the forefront of the digital transition and the new production methods, HE-Arc Ingénierie set up the MicroLean Lab.

1. The microfactory that is being developed through the MicroLean Lab.

2. Micro^5, the 5-axis machine developed by the Haute Ecole Arc Ingénierie, is adapted in order to fit into the microfactory, as one of the specific functional units.



2.

The arrival of the «Micro^5» in 2016 kick-started a revolution in terms of microtechnology production methods. Developed by engineers at the Haute Ecole Arc (HE-Arc), this technological gem consumes ten times less energy and takes up five times less floor area than conventional 5-axes milling machines.

«The purpose of this new industrial vision is to achieve the aims of Industry 4.0, from personalising products to reshoring production tools through the use of digital technology.»

Philippe Grize, Head of the Haute Ecole Arc Ingénierie

With that micromachine now being manufactured and sold by several Swiss businesses, HE-Arc Ingénierie is taking things to the next level: the microfactory. The microfactory is not just a single milling machine, but the entire production system used by the microengineering industry that will henceforth be designed to be exactly the right size for the components and finished products it manufactures.

By scaling the factory more efficiently, both the energy consumption and the footprint will be lower. In addition, microfactories will allow manufacturing to take place closer to the end user, thereby reducing the need for energy-intensive, global logistics with risky supply chains.

A reconfigurable, connected, autonomous microfactory

To achieve this, a wide range of miniature «technology bricks» need to be designed. Each will perform a specific operation, such as milling, bar turning, polishing, laser cutting, measuring, cleaning, and even 3D printing.

A cyber-physical system will provide an agile, autonomous means of moving parts and tools from one machine to another, from the stock of raw materials to the finished product. Each piece of miniaturised milling, assembly, handling and control equipment needs to be able to communicate with the others, in other words it must use standardised communication protocols that allow data to be collected and used effectively.

With its «plug and play» technology bricks, the microfactory will be easy to reconfigure so that custom products can be manufactured at a similar cost to mass-produced items. This will enable the microtechnology industry to respond to the growing demand for personalised products, whether they be luxury items or medical implants. More generally, the industry will be able to switch to production processes that suit a demand-based economy.

Thanks to interconnected sensors and embedded artificial intelligence, the microfactory will also be capable of perceiving what it is doing and adapting its work in real time in order to get the products it makes right the first time.

Of course, there are no shortage of technological challenges involved. And the various industrial and academic partners who have joined the MicroLean Lab's community of interest will require all of their know-how to overcome them. But they are capable of living up to the expectations of a society that is increasingly aware of the environmental and socioeconomic impact of its actions.

www.microleanlab.ch
www.he-arc.ch/ingenierie

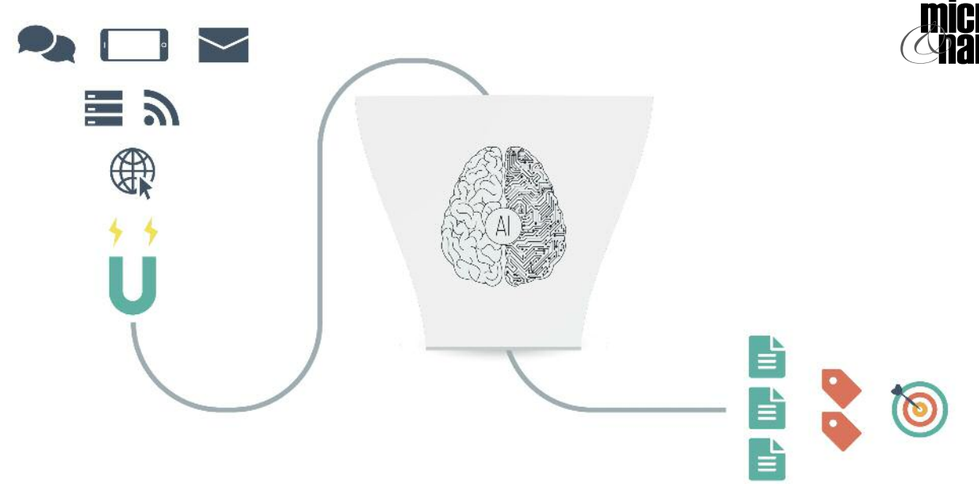
1. Illustration of the connections between information, turning it into intelligence.

2. Schematic representation of the process and platform developed by enovating, mixing AI and human capabilities.

Founded in 2018, enovating makes its clients' data «speak» thanks to unique tools for information capture, analysis and exploration. The power and interpretation of sorted data lies in the connections between this information, turning it into intelligence.

Driving innovation through AI structured information

1



2

With the globalization of markets, the intensification of competition and the rapid evolution of technologies, the mastery of strategic information has become vital for both large companies and SMEs that want to adopt a proactive approach to the rapid changes in their environment.

«We absorb large datasets to answer strategic questions and predict future trends.»

Dr. Raphaël Imer, COO and co-founder

Today, we are immersed in data, social networks, music and video sharing sites, connected objects, and location-based services that continuously generate gigantic amounts of data. The challenge for companies that have access to this megadata is to be able to use it efficiently while avoiding information overload.

With more than 25 years of experience altogether in the field of innovation, enovating has developed a platform for information acquisition, analysis and exploration, allowing it to process millions of data and thus answer its clients' strategic questions.

IA made to serve information

Even though information is quite easily accessible, its real value for a company lies in a given context, namely when it can be linked together. Yet, creating these links is a complex process that requires time and resources.

Thanks to the most recent technologies in artificial intelligence, machine learning and deep learning, this process has been optimized and energized. Intelligent robots browse the web and collect data on companies, products, people, scientific publications and patents. Algorithms automatically extract structured information from visited pages. A learning system sorts and categorizes the retrieved information according to predefined criteria. Finally, neural networks weave links between the selected information in order to establish possible outcomes or deduce future trends.

These tools, which are essential for acquiring and processing millions of pieces of data, enable the automation and acceleration of information analysis. They are an indispensable complement to the expert, whose knowledge of the field and interpretation of the data remains an essential link in the success of the process.

Unique process and *enobox* platform

enovating's know-how has enabled the simultaneous integration of every tool required to process very large amounts of data for many projects on a single platform called *enobox*.

In order to make full use of the information and draw all its intelligence from it, a unique process in four iterative phases has been developed. Several connectors allow the collection of all types of data - structured and unstructured - to cleanse and standardize them in order to create a corpus of relevant sorted information to provide personalized services to customers.

Identifying tomorrow's markets

At the end of 2019, the CSEM and enovating launched a joint pilot project aimed at identifying future opportunities for the technologies developed by the CSEM. As part of this project, the weak signal analysis process developed by enovating has been adapted to explore new fields of application for selected technologies, thus enabling the identification and prioritization of new potential customers.

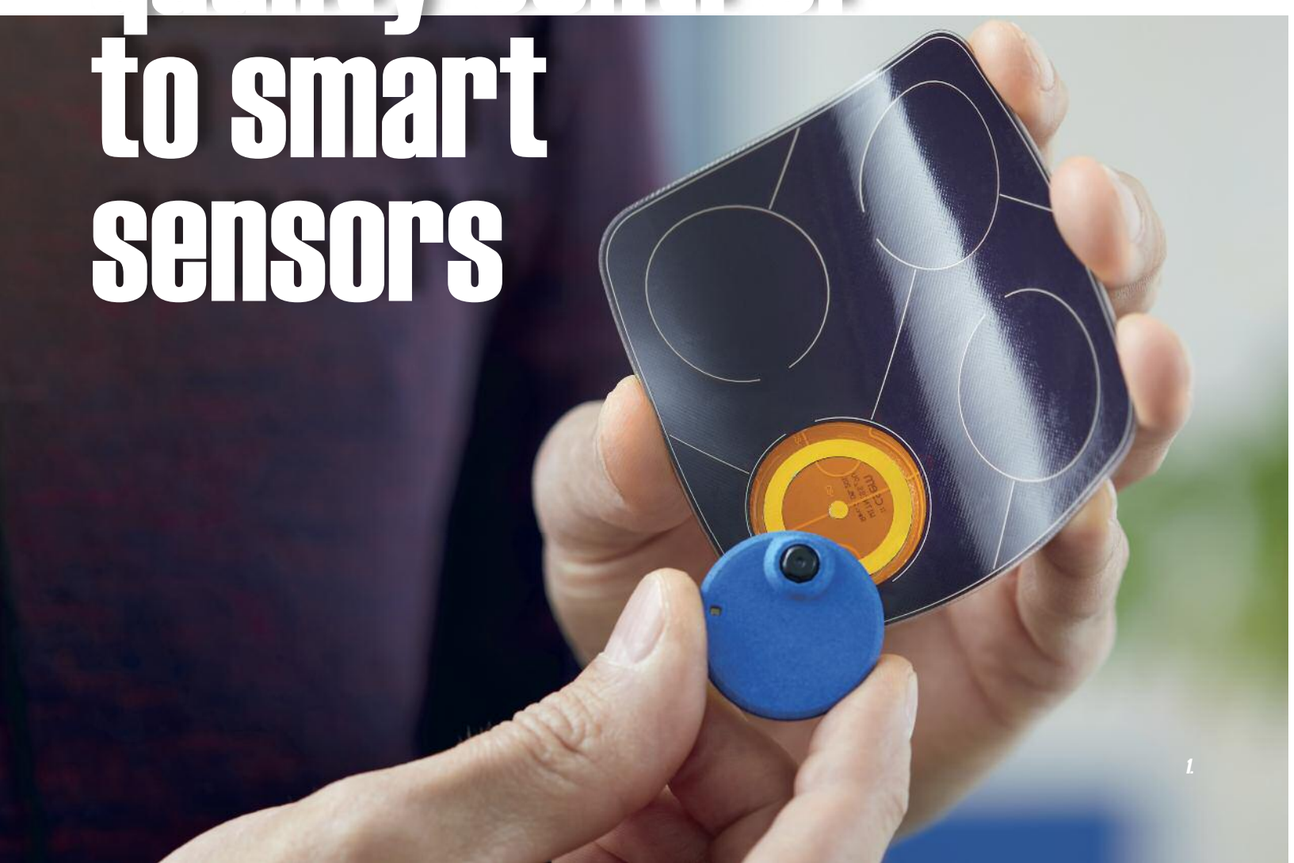
www.enovating.com

«The future is small, smart and sustainable.»

Andrea Dunbar, Head of Embedded Vision Systems

The advent of cheap and powerful computing is driving the emergence of smart sensors able to make high-speed decisions on the fly, without sending data to the cloud. «Edge AI» can improve quality and productivity as well as creating new business models and services.

Edge AI from quality control to smart sensors



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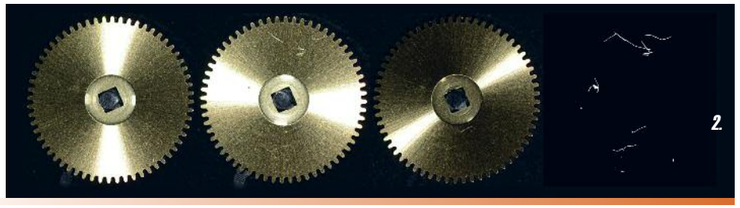


2.

Contact and Trace has proved a key weapon to curb the spread of COVID-19, showing how essential digital technologies have become. Digitalization impacts our daily lives, influencing what we watch, where we go, and how we communicate. While «Big Data» approaches employed by the likes of Google and Amazon can seem disconnected from the requirements of SMEs, digitalization is also changing the way all businesses operate, from smart sensors to Industry 4.0, offering growth opportunities to companies who embrace these new technologies.

CSEM has been bringing innovative technologies to SMEs for over 30 years. With roots in Western Switzerland, micro-nano technologies are in our DNA; research initially focused on the local watch industry. Less well known is CSEM's pioneering work in machine learning and smart sensors (sensors with embedded intelligence). Indeed in 1995, we helped develop the world's first optical character pen reader. Today the widespread availability of cheap but powerful computing and the quantity of digital data are fueling digitalization even for the smallest businesses.

Fast forward to 2020, to defect detection, a common problem faced by high-value low-volume manufacturing of micro-nano technologies. Defect detection is a challenge due to the diversity of defects and the difficulty in detection, often requiring specialized lighting. Indeed, the debate as to what constitutes a defect can exist between human operators; even the same operator can be subject to labeling variation depending on the time of day. For a data-driven technique there is the additional problem of a limited number of defective samples to train the algorithm.

To tackle these challenges CSEM combines the latest data enhancing techniques. An example is data augmentation, where a small amount of data, through operations such as rotation, shifting and transformation can be sufficient to train the algorithm. We specifically look at improving data algorithms for industrial situations such as multi-illumination setups.

Capturing and labeling the data is cited as 80% of the cost of data projects. CSEM has been developing a complete end-to-end digital solution. Starting with «PUCK» a Plug, Use and Collect Kit, which allows infrared, sound and video data to be recorded and «SpectroX» which captures multispectral reflection, we develop labeling tools which automatically label the features of interest whether it be a malignant skin condition, a scratch, or the number of people in a room, this significantly reduces the cost of data projects.

3.

4.

5.

1. *Witness: fully autonomous through PV recharging, ultra-low power imager that can be used like a sticker.*
2. *Watch Parts: Defects illuminated from different directions along with ground-truth binary mask representing the defects.*
3. *MoneyPen: The World's first optical character pen reader based on an embedded Convolution Neural Network.*
4. *SpectroX: simple customizable handheld multispectral kit, application here of skin condition classification.*
5. *PUCK: Plug, Use and Collect Kit with thermal imaging, audio, and video sensors running algorithm for inference while also collecting data.*

In contrast to cloud computing, which involves indiscriminate data collection, edge processing of sensor data involves embedding algorithms either locally or alongside the sensor, be it a camera or a microphone, allowing for low latency for very fast decision-making. These considerations are paramount for applications requiring privacy or high speed such as printing or for predictive maintenance where the speed of shut down and repair can be crucial to the bottom line.

Swiss SMEs today are starting on digitalization using discrete systems where the return on investment is clear. Yet we are only scratching the surface of the potential of machine learning and digitalization to transform business. Next are connected systems, so-called «hierarchical computing», which connects these discrete systems, as well as self-learning systems, which evolve with the production. The future will be here sooner than we think, offering opportunities to improve productivity, sustainability and quality, as well as offering new products and services.

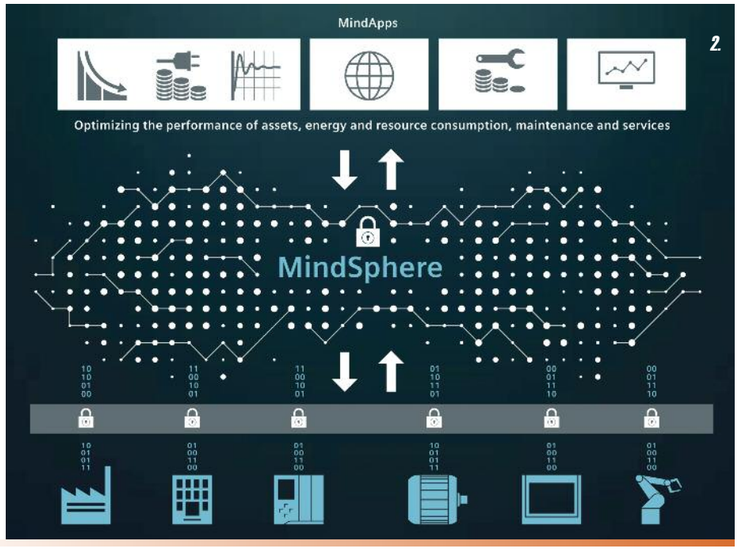
www.csem.ch

1. Digital technologies provide industry with countless production and business opportunities.

2. MindSphere supports users with applications for analysing data and bringing new insights.

What makes useful data analysis so challenging is that algorithms for pattern recognition and machine learning must be properly combined and coordinated – turning big data into smart data.

Siemens-MindSphere transforms data into knowledge. And knowledge into business success.



«Digitalization generates a fast and easy ROI, plus you obtain a high level of efficiency and fascinating findings even from your first set of data.»

François Guillet, Consultant Industry Services Siemens Switzerland

Technical and organisational mastery of production, maintenance and service processes is attracting increased attention. The use of smart data not only means that processes are being optimised, but opportunities are being created to build entirely new business models: mechanical engineers are able to read service data from machines and identify the causes of disruptions more efficiently during service calls. Plant operators are able to compare power consumption and faults in machines at an early stage, avoiding downtime and enabling OEMs to give recommendations for optimising production. Good maintenance, for example, allows the warranty period to be extended or OEMs to offer completely new business models such as «smart maintenance» for systems and machines. These are precisely the developments that MindSphere supports.

Ecosystem for developers and makers

MindSphere digitally depicts the complete lifecycle of production plants and their components in data structures and functionality. In this way, MindSphere enables industrial companies to continually improve system performance by collecting and analysing large volumes of production data. At its core, this high-performance IoT operating system comprises data hosting, data analysis, high connectivity, tools for developers, configurable applications and services for optimal performance of all equipment with maximum availability. Artificial intelligence optimises operations, thus creating transparency and competitiveness.

In the process, MindSphere supports users with applications for analysing and using data in order to obtain new insights, identify trends and meet today's challenges.
For example, there is an app that automatically calculates all relevant OEE figures, making it easy to identify optimisation potential. What's more, all MindSphere users can also develop, use and sell their own Web services, and implement them as the basis for their own digital services – such as in the area of predictive maintenance and servicing, energy data management and resource optimisation. OEMs and app developers have the ability to access the platform via open interfaces and to use it for their own services and analyses, for example to analyse the machine data of a global machine fleet in order to monitor it for service purposes and to minimise downtimes.

Transforming data into business success

Seamlessly optimised and digitally integrated processes accelerate the launch of innovative products and smart services. Moreover, digital technology gives rise to countless new production processes and business opportunities in the manufacturing industry.

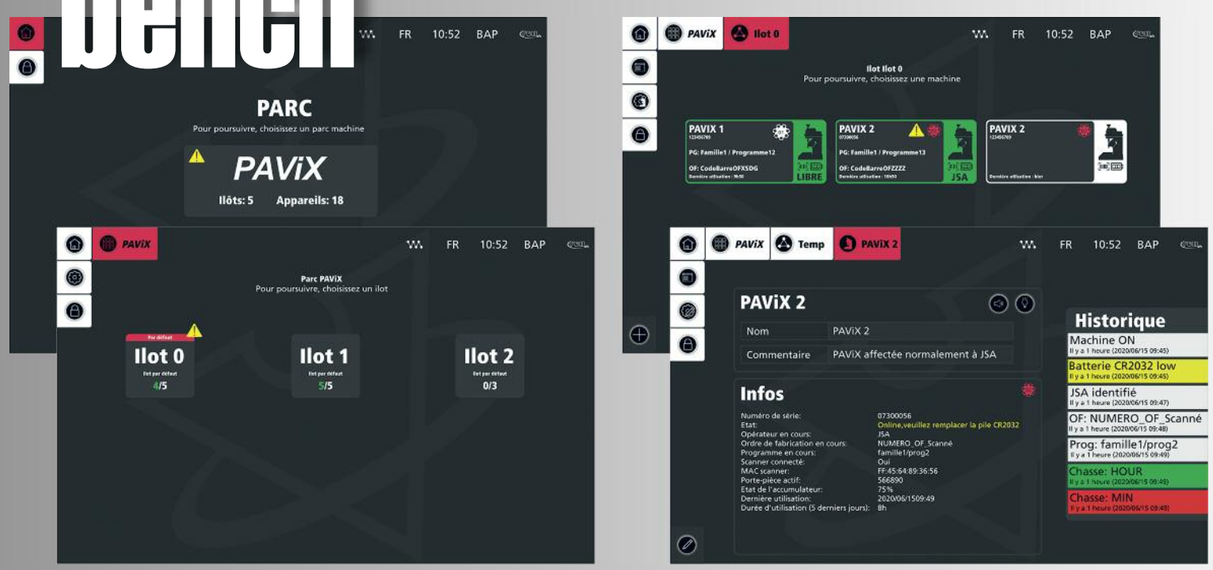
The more industry becomes digitised and networked, the more interfaces are created and the more data can flow. With MindSphere, Siemens is offering the leading industrial IoT-as-a-service solution with high connectivity, an integrated security concept and access to the App Store. The use of MindSphere opens up an entirely new way of helping to improve asset management and energy efficiency through data analysis and simulation and providing companies with comprehensive support on the path to digital change.

www.siemens.mindsphere.io/en

«The future of mechatronics lies in data processing.»
Bastien Paratte, Head of R&D

A modern company in perpetual search for innovation, VOH SA is a true solutions factory that has been offering state-of-the-art equipment and original solutions for the watchmaking and microtechnology industries since 1995.

LINKiX, Smart Production on the watchmaker's workbench



1.

2.

1. To increase the number of connected devices, reduce bandwidth and consumption, data is pre-processed on the devices and only relevant data is exchanged over the mesh network.
2. A workshop equipped with 50 PAViX gallows, each performing a needle exposure every 15 seconds, will generate a transmission every 0.3 seconds lasting a few milliseconds.
3. Universal and intelligent VOH hand-setting bracket, LINKiX complient. Functional control of the hand-setting operation through force measurement and height control.

Responding to market expectations, VOH has developed an innovative smart production concept adapted to the world of watch manufacturing. Human operators stay at the center, their intelligence and adaptability are essential in watchmaking, with technology supporting them. Our smart production system assists and informs the operator, traces the various operations and events, allows cross-functional monitoring of production and overall control of operations.

The new LINKiX ecosystem integrates the new generation of VOH equipment such as PAViX, designed for watch hands fitting. It enables production at all times according to controlled criteria and parameters, independently of the operator. Total traceability makes production drifts detectable, analyzable and quantifiable. Productivity and quality are guaranteed through a system meeting the usual production volumes and flexibility requirements of manufacturing companies.

Optimizing the operator's bench

The workspace of a watchmaker is defined by his workbench, imposing ergonomic, compact and autonomous devices. Our wireless products saves space, improves ergonomics and order on the workstation while avoiding connection errors. VOH devices consume low, offer limited choices of direct interaction, allow communication, programming and adapted data transfer. This Smart Production ecosystem relies on cutting-edge technologies that guarantee high security and flawless robustness in data transmission. It is adapted to future products, as well as to existing products by upgrading, without modifying operation processes, just adding the functions required for smart production.

Humans are now used to interactions with their environment through smartphone applications. We have designed our system with the same principles: LINKiX is the operating system and each type of product has its own dedicated application. LINKiX is able to operate as a stand-alone system without a client network link or can be integrated into the client network through a single bridge.

Hardware elements include the wireless communication module and a terminal with an ARM minicomputer, a touch screen and a communication module allowing the LINKiX system devices to be managed graphically through a wireless mesh network and bridged to the customer's network or a NAS.

Each device integrated into the LINKiX network sends its measurement / traceability data and status in real time. It can be configured and programmed individually or in groups from the terminal through dedicated applications. To increase the number of connected devices, data exchange over the mesh network is optimized to reduce bandwidth and consumption, data is pre-processed on the devices and only relevant data is exchanged.

Global workshop monitoring is the goal of LINKiX: the network is divided by device type, manageable as a whole, as an island or individually. Also different equipments can be grouped and monitored.

Any machine with embedded intelligence must have scalable firmware. The LINKiX terminal allows updates through the mesh network, scheduled outside business hours.

www.voh.ch

3.

Human-Robot co-working made easy, fluid and safe

In Delémont, Jura, the HUMARD Automation SA team, passionate about innovation and new technologies, has been developing for 25 years specific production solutions for their customers within an anticipation of the industrial world of tomorrow.

1. This new generation robot can be combined with a Kart'HUMARD system. It then becomes totally independent and autonomous in its movements.

2. An Automatic Guided Vehicle (AGV) mobile collaborative robot you can equip and automate for your transport operations.

3. Tailored to measure, the Processline integrates different operations or processes in order to meet production requirements in every respect.

1.

2.

A factory for the future is connected, flexible and efficient. It will revolutionize industrial processes, based on new technologies and innovation. HUMARD Automation SA is therefore constantly reinventing itself to continually meet the demands of its customers but also to offer them innovative solutions.

In addition to the standard product lines of HUMARD Automation SA (loading robots, hydraulic presses, palletization, assembly line), a new product line has been developed within the company: Industry 4.0.
This industry of the future is a revolution in the industrial environment. It offers work autonomy and also contributes to the prevention of MSDs (musculoskeletal disorders).

«We must always be at the cutting edge of technology in order to offer the best solutions to our customers.»

Jimmy Ackermann, Head of Business Development

From this product line, the Kart'HUMARD is a combination between the AMR MiR robot and custom-made adaptations created to meet industrial demand. The Kart'HUMARD moves easily and safely. It avoids obstacles and people by bypassing them. In addition the robot movements do not require any special programming knowledge. Directly from a smartphone, a tablet or a computer, it is possible to control it and to assign it various missions thanks to an internet connection. Capable of overcoming all kinds of obstacles such as doors or elevators, Kart'HUMARD can be used in almost any situation where employees have to push carts or make deliveries. Transporting up to 1'000 kg of material, such a solution protects the physical health of the employees and thus allow to evolve towards Industry 4.0.

The YuMi collaborative robot

Designed to work hand in hand with humans, the agile, fast and precise YuMI robot can assist them, in particular by limiting the drudgery of repetitive manual tasks. It integrates safety functions (sensors, cameras, etc.) so that no fairing was necessary and Human-Robot interactions are therefore fluidised. YuMi detects the slightest change in its environment and stop in a few milliseconds. Its ergonomic arms have 7 axes each that allow it to reproduce human movements. Integrated as a base on its 'HUMARD' station, this versatile robot can be adapted to various applications within the company. In addition to the safety aspect, it is also a guarantee of quality, capable of working 24 hours a day. This «new generation» robot can even be paired with a Kart'HUMARD. It then becomes totally independent in its movements and therefore more reactive, entering the era of the industry of the future.

These technological improvements are also used for the turnkey machines that HUMARD's designs in its dedicated office following the specific requests of customers. Developed in the technical office and as-sembled in the workshops of HUMARD Automation SA, special machines are therefore created hand in hand with the customer according to his needs.
On the lookout for the slightest new products and mechanical, electrical or software innovations, the engineers from the «Delémontaine» company won't miss any new part that could be integrated into their special machines.

www.humard.com

3.

The digitalisation of health systems is an ongoing revolution and artificial intelligence (AI) will play a key role. AI-powered medical devices and telemedicine will improve the quality of connected care pathways, particularly in times of confinement such as the COVID-19 situation.

1. Digital stethoscope prototype (Minimum Viable Product).

2. **David Rivollet,** Machine Learning Engineer, HUG
Alain Gervaix, Professor, M.D., Chairman, Department of Woman, Child and Adolescent, Head of the Pediatric Reception and Emergency Division, HUG
Mohamed-Rida Benissa, Pediatrician specialized in pediatric pneumology, biomedical engineer, Institute of Global Health, UNIGE.
Alexandre Perez, Systems Engineer, HUG.

3. Procedure for recording and analysing lung sounds.

1.

AI powered digital stethoscope: new ways for personalised medicine

2.

From stethoscope to digital stethoscope

In the history of medicine, the stethoscope heralded a breakthrough in diagnostic innovation for heart and respiratory diseases. Invented by René Théophile Laennec in Paris in 1816, it was designed to improve the diagnosis of respiratory diseases in children, which was the leading cause of mortality in the 19th century. Since 2008, the stethoscope has evolved further in line with digitalisation and there are now numerous models and a wide range of forms and connectivity. The digital stethoscope (DS) detects, amplifies, and records heart and lung sounds, and can be used in telemedicine for remote diagnosis by a physician.

Pneumoscope project

The *Pneumoscope* project is a further step in this evolution. Born out of the initiative of a team of paediatricians at HUG/UNIGE working in close collaboration with engineers in acoustics, signal processing and embedded electronics at HEPIA, and in machine learning at EPFL, this innovative research project aims to create new DS-embedded autonomous artificial intelligence algorithms, which can analyse lung sounds in real-time, act as a medical ear to identify respiratory disease patterns, and provide useful information to the user through a user-friendly application displayed on interactive support. Yet, innovation merely in terms of the AI-DS was not enough for our team to make a significant impact at the patient's bedside. Biosensor integration of a reflection oximeter and a thermometer is a major asset of the *Pneumoscope* project. The contribution of these clinical parameters makes it possible to refine the accuracy of the diagnosis to automatically identify the most severe forms that require specific care in hospital.

Changing the paradigm

In this time of confinement or scarcity of physicians in many countries, many patients are away from their doctors and alone with their disease and anxiety. Our objective is to bring this technology directly to patients, as well as to those working on the frontline of healthcare services such as pharmacists, nurses, midwives and community health workers in low and middle-income countries. This new AI-DS will empower the user and improve the quality of connected care pathways by generating alerts, diagnostic assistance and even therapeutic choices.

> **«Adding AI to auscultation provides safer patient diagnosis.»**
> *Prof. Alain Gervaix*

Data-driven technology

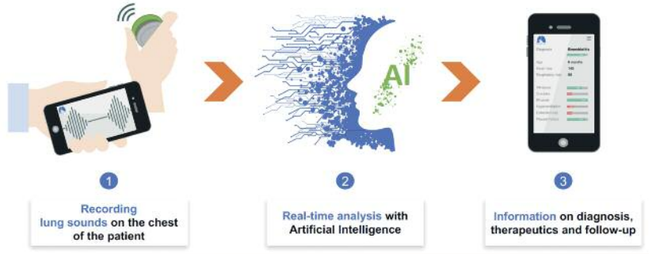
The essence and originality of this project is also the creation of an auscultatory database of respiratory diseases in children and adults. This valuable clinical research database will evolve to become a secure, anonymised patient data registry. Such a registry will be the most appropriate database for improving diagnosis accuracy at the point-of-care. We are currently collaborating with 10 centers in 8 countries around the world, and more than 8,000 records have been secured.

Applications and operators

In light of this patient-centred research approach, which aims to improve precision when diagnosing respiratory diseases, and when considered as part of a genuine strategy to optimise healthcare costs, the *Pneumoscope* project could thus see the use of the stethoscope being extended and it being welcomed in every household in Switzerland and abroad. Our stethoscope would become an indispensable medical device in the home, on a par with the blood pressure monitor or thermometer. While it took a long time for the stethoscope to become established in the medical community in its early stages, the current expertise in new assistive diagnostic technologies will likely facilitate the rapid spread of the DS among health care professionals and the COVID-19 pandemic will undoubtedly accelerate this process.
A start-up company to promote our AI-DS will be established soon.

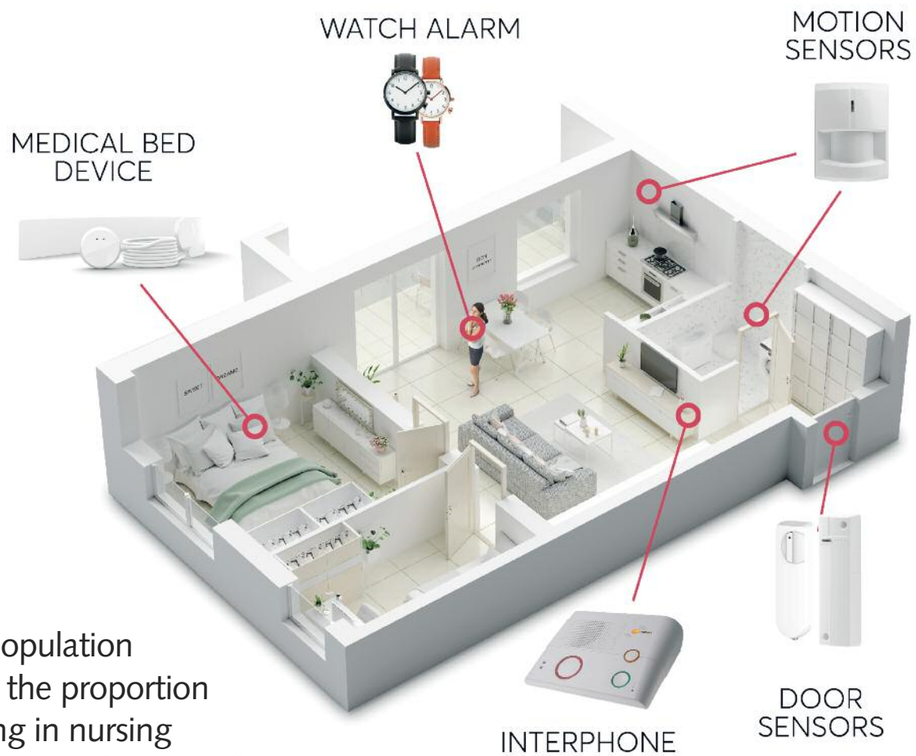
www.unige.ch
www.hug.ch

AI: Artificial Intelligence
DS: Digital Stethoscope
EPFL: École Polytechnique Fédérale de Lausanne
HEPIA: Haute École du Paysage, d'Ingénierie et d'Architecture de Genève
HUG: Hôpitaux Universitaires de Genève
UNIGE: Université de Genève



3.

Telemedicine: an alternative to retirement homes



1.

The world's population is ageing and the proportion of elderly living in nursing homes will increase dramatically, leading to increasing public spending. In order to limit these costs, DOMO offers an innovative system that allows people to stay at home safely.

According to the Federal Statistical Office (FSO), Switzerland currently has more than 1.5 million inhabitants over the age of 65, which represents 18% of its population. This share should increase to nearly 21% in 2025, more than 24% in 2035 and exceed 26% in 2045. By then, according to the scenario of the FSO, the number of seniors will have almost doubled [1].

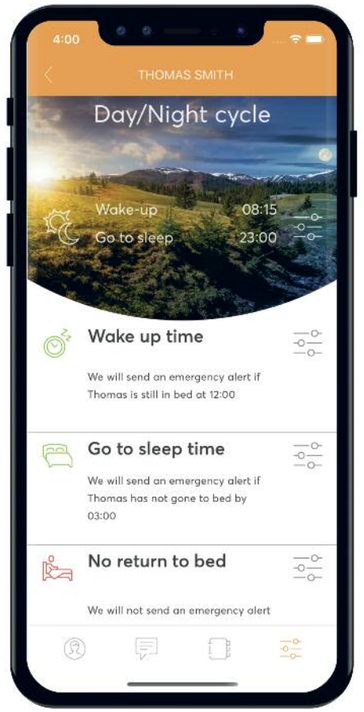
«The future of home care is about predictive and preventive medicine.»

Guillaume DuPasquier, Co-founder

This growth of senior citizen's number is due to improved living conditions, medical development and social progress that lead to a worldwide increase in life expectancy. This unprecedented demographic change is a real challenge for society and the Swiss healthcare system, which must now face the price of this success: the increase in chronic pathologies affecting the elderly, the need of new retirement homes and the resulting costs. DOMO, a company from the École Polytechnique Fédérale de Lausanne (EPFL), designed an innovative system that uses machine learning to send personalized alarms in case of health deterioration or an emergency at home.

A system that promotes preventive medicine

The only solution with chronic pathologies is a 24h/24 health monitoring, which is normally very expensive and time consuming. DOMO has developed a system that easily detects a health deterioration by simply putting a bed sensor under the mattress. When the sensor detects a physical change (tachycardia, sleep apnea) it automatically sends an alert to the family or caregivers so that they can act preventively.



2.

The entry into a retirement home: a moment to delay

In addition to chronic pathologies and costs increase, retirement homes will surely not be able to meet the growing demand. The objective of DOMO is to allow the elderly to stay independent at home as long as possible with a system that detects falls or unusual behavior and sends an alarm to the family or the emergency call center. This system is very useful for people suffering from dementia or Alzheimer because the network of wireless sensors (door, movement and bed sensors) detect if the person falls, goes outside during the night or doesn't move during the entire day. A mobile app is also provided for relatives and caregivers that informs them about the person's health, interacts with the caregivers and sets up personalized alarms according to the person's lifestyle.

1. Plan of an apartment protected by our security and health system.

2. The mobile app that informs about the person health, interacts with caregivers and sets up personalized alarms.

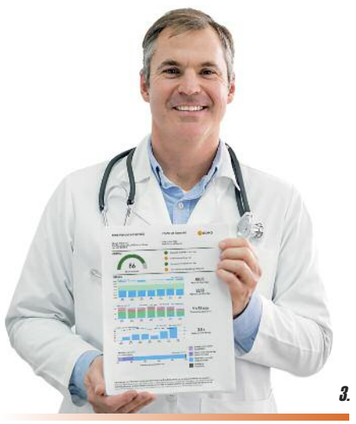
3. A system that improves preventive medicine.

A system based on machine learning

During the first two weeks, DOMO's technology records the lifestyle of the monitored person and establishes a behavior baseline. Then, if there is a change of behavior from the baseline, emergency or preventive alerts are shared with 24/7 call centers or home care organisations. The technology has been built with more than 200'000 of days analysed and uses unsupervised and supervised techniques. The clinical studies, conducted in collaboration with CHUV, the Inselspital of Bern and Nursing School of La Source in Lausanne, have been published in renown scientific newspapers such as Nature Scientific Report or Frontiers.

www.domo-safety.com

[1] *Federal Statistical Office. (2018). Active ageing. FSO News. Swiss Confederation.*



3.

«In Switzerland, water is a source of innovations.»

Laurent Horvath, Smart Water Innovation Manager

The water industry is perceived as a technologically old-fashioned field with systems from the past century. Let's be honest, this is true. However, things are evolving rapidly. Microsensors, nanotechnologies, digitalisation on top of the global warming are changing the paradigm and the speed of the transition.

Water as a source of new technologies and business

1. Water, the gold of tomorrow.

2. Intelligent irrigation LoRa device, for accurate farming decisions by Farm21.tech - Orbiwise.com

3. Drinking local water in the huts of the Swiss Alpine Club.

Switzerland is the Saudi Arabia of water. Many of its glaciers create rivers and bring water across Europe. Therefore, water has been perceived as plentiful and guaranteed. Its price is undervalued, sometimes free of charge and more than occasionally, wasted. However, from a time of abundance, we are moving towards scarcity. From a low-value commodity, it is becoming a limiting resource if we continue to not care of it. With pollution, its quality is degrading. Irrigation becomes a challenge for farmers – even in Switzerland. Forecasts for 2030 and beyond are not very optimistic.

A transformation is taking place, particularly under the leadership of the European Green Deal, Water Europe, and the need for the public utility companies to adapt to the situation.

From Mega to Micro

From large and heavy sensors, we see a trend to miniaturise them to decrease their energy consumption and, above all, to offer more affordable devices. These changes allow the water utility companies to improve their daily business and to make better decisions. Smart watering systems are helping them to adapt their business models and increase water efficiency. If today, customers are paying a yearlong flat fee for their water consumption, we can imagine that the prices could fluctuate based on the season or the accessibility of water. This system could be a game changer in diminishing waste and over consumption.

The LoRa sensors can help by monitoring the quality of water sources remotely, measure the amount of waterflow used for irrigation or assist farmers in providing the exact amount of water for their crops.

We look outside of the water industry

To innovate, non-water companies are a good place to start. As an example, drones are being used for remote sensing, accurate measurement or even monitoring sources and small lakes. Since the autonomy of UAVs is related to the weight they carry, miniaturisation of these components is essential. On-board technologies must also be improved to enable autonomous flights and avoid obstacles and accidents.

Citizen science

New technology could open the doors of the households. In this field, the potential for growth is very large, particularly with mini sensors that allow the inhabitants to be informed about their consumption, in particular, in the bathroom or the use of hot water. But there could also be information about the quality of the water, or even its treatment with nanotechnologies in situ or during outdoor activities.

Join the ecosystem

In this paradigm shift, the Swiss innovation and the Micronarc's members, such as start-ups, academics and SMEs could bring answers. How to mitigate waste when irrigating fields? How to measure the water quality in remote sources? How to treat water in small villages or at home? How to serve local water in the huts of the Swiss Alpine Club?

For all of these reasons, several cities concerned with the water resource and the Canton of Valais joined efforts to create the innovation hub BlueArk, the outdoor laboratory for smart water.

This ecosystem helps SMEs, academics, entrepreneurs and start-ups to launch new ideas, to test at 1 to 1 scale new technologies, business models or services. The goal is to speed up the digitalisation of water and the technologies that can be used in Switzerland, in the Alps and all over the world.

www.BlueArk.ch

The new T-Touch Connect Solar by Tissot is a connected watch with an array of modern features and a solar-power-charged battery. Swiss Made, this fine timepiece is interactive and built to last, with a contemporary design and complete protection of users' personal data.

T-Touch with a solar dial and custom operating system

1

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This new watch is the latest generation in a long line of tactile timepieces. It's water resistant to 100 meters and made of durable materials, meaning it's protected against obsolescence – especially the planned obsolescence of many consumer electronics.

This new timepiece has all the basic features of the T-Touch Expert Solar, including a countdown timer, other timekeeping functions, alarms, weather information, an altimeter and an activity tracker. Users can also get notifications about calls, messages, apps and updates through an interactive function between smartphones and the watch's operating system, called SwALPS (for Swiss Autonomous Low Power System) – an ultra-low-power OS that was developed entirely in Switzerland. And like the entire T-Touch range, this newest addition is controlled using its hallmark feature: a tactile sapphire crystal.

Data security

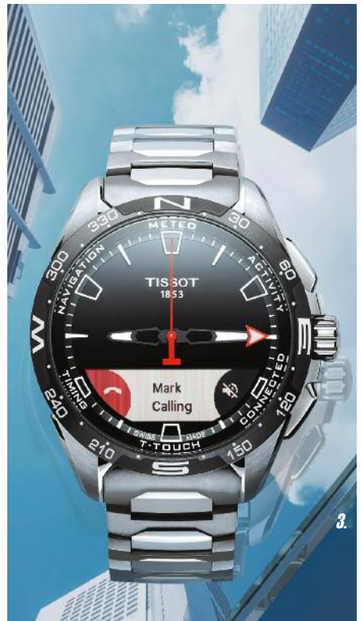
One key advantage of the T-Touch Connect Solar is that it is fully designed and manufactured in Switzerland. This provides a guarantee not just of the timepiece's craftsmanship and quality, but also of the security of the data it collects. The data cannot be accessed by any suppliers through the watch's components or operating system, and neither the watch nor its app transmits data to third parties.

Low-power components and a solar dial

To give the watch as long a battery life as possible, all of its components are designed to require little energy. The ultra-low-power SwALPS operating system was developed by CSEM in association with Swatch Group, and the photovoltaic cell used in its dial was created by CSEM in Neuchatel.

Thanks to these innovations, the T-Touch Connect Solar can run almost indefinitely when it's not connected and several months when it is, depending on how it's used and how much sunlight it's exposed to.

Finally, the T-Touch Connect Solar is universal, as it's compatible with the iOS, Android and Harmony operating systems – making it the first smartwatch compatible with Huawei devices. Additional features will be added in future updates. When the watch is not connected to the smartphone app, users can still enjoy all the features of the T-Touch Solar Expert – but updated.



3

1. The Tissot T-Touch Connect Solar, direct descendant of the T-Touch collection and the first multifunction tactile watch, is now: connected, hardwearing, privacy-protecting, interactive, autonomous and contemporary.

2. CSEM clean rooms where the photovoltaic dials are manufactured.

3. Data cannot be accessed by any suppliers through the watch's components or operating system, and neither the watch nor its app transmits data to third parties.

Julien Bailat, Section Head, Thin Film Devices, CSEM
Julien Bailat and his team developed the solar dial for the T-Touch Connect Solar and the associated manufacturing process. His engineers drew on CSEM's expertise in thin film deposition and microfabrication to create a photovoltaic cell with superior performance in low-light conditions. Their cell's sophisticated design meets the high standards of the Swiss watchmaking industry: luxurious style coupled with immaculate precision.

Edo Franzi, Section Head, Firmware & Security for Connected Devices, CSEM
The proprietary operating system and real-time kernel used on the T-Touch Connect Solar – developed entirely in Switzerland – provide maximum data security with minimal energy use at all times. This was made possible thanks to CSEM's over 20 years of experience at the cutting edge of microprocessing and low-power systems.

Features

- Swiss made
- SwALPS low-power operating system
- Titanium case, black PVD and pink gold coating
- 47 mm diameter and 15.3 mm thick
- Engraved pushbuttons
- Electronic crown
- Ceramic bezel
- Luminescent wind rose markings
- Scratch-resistant, tactile sapphire crytal
- Water resistant to 100 m (10 atm)
- Quartz movement, solar-charged battery
- Dial with photovoltaic cells
- Low-energy, memory-in-pixel (MIP) digital screen.

www.tissotwatches.ch

In 2019, the community initiative CODE41 took on a somewhat crazy challenge: to develop and produce inside its community a watch with an exceptional mechanical manufacture movement. When pre-orders were launched, the X41 met with marked success. The watch's design and materials have evolved over the course of several editions.

Swiss watchmaking reimagined

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2

1. The «AeroCarbon», one of the X41s, is made from aeronautic carbon fibre.

2. The X41 sports is a Fine Watchmaking movement.

3. The X41 is fitted with a peripheral oscillating weight.

More than just a brand, CODE41 is above all a community movement consisting of more than 400'000 members who take part in the development of mechanical watches. Created in 2016, CODE41 is an advocate for transparency, particularly in the origin and cost of the components of its watches. Members are therefore aware of all production-related costs, and can acquire a watch with unbeatable value for money.

«Don't just settle for owning. Play your part.»

Claudio D'Amore, founder

X41: an exceptional movement

CODE41 took on the challenge of developing a watch without compromise. That's why founder Claudio D'Amore called on one of the best designers in Switzerland. Courfaivre (JU)-based Timeless makes all of the components used in its movements in-house (except for the balance wheel). In fact, it's not uncommon to find manufacture movements fitted with parts from mass-produced movements. Thanks to the expertise of this Swiss workshop, the X41 boasts a Fine Watchmaking movement fitted with a peripheral oscillating weight. Resting on 31 ball bearings, it does nothing to obstruct either the display or the magic of its skeletal design.

One of the X41s is made from aeronautic carbon fibre

Extremely resistant, carbon fibre is one of those technical materials that goes perfectly with the magic of mechanical watchmaking. For its fourth edition, CODE41 has rubbed shoulders with the aeronautics and aerospace industry to create the X41 AeroCarbon. Made for us on demand in France, the carbon fibre blocks are made up of over 300 layers, each positioned at 90° to the previous, and compacted under 10 bars of pressure in an autoclave oven. This process guarantees an exceptional composite that's 2.5 times more resistant to bending than steel. In addition, its high density means that the AeroCarbon is watertight without the need to add a titanium ring, as is the case with the less dense and more porous carbon fibre normally used in watchmaking.

CODE41's very own distribution model

CODE41 is not a traditional watchmaking brand. By creating a new distribution model and digitizing its actions, the young Swiss brand has been able to impose itself on a market in the midst of crisis. Consumer expectations have also evolved significantly. By taking more interest in the origin and production conditions of the products that interest them, the consumer becomes an important actor in the marketing chain. And CODE41 understands this better than anyone else, with a community of over 400'000 members and more than 16'000 customers!

www.code41.com
www.label-tto.org

3

As the industrial revolution was spreading, Western Switzerland got inspired by timekeeping. The area has still the most accomplished and prestigious watchmaking industry in the world, while its brilliant technical skills have matured into micro, and now nanotechnologies, to meet the highest demands.

The Brienzer Rothorn steam-powered cogwheel train in the Bernese Oberland. View of Lake Brienz.

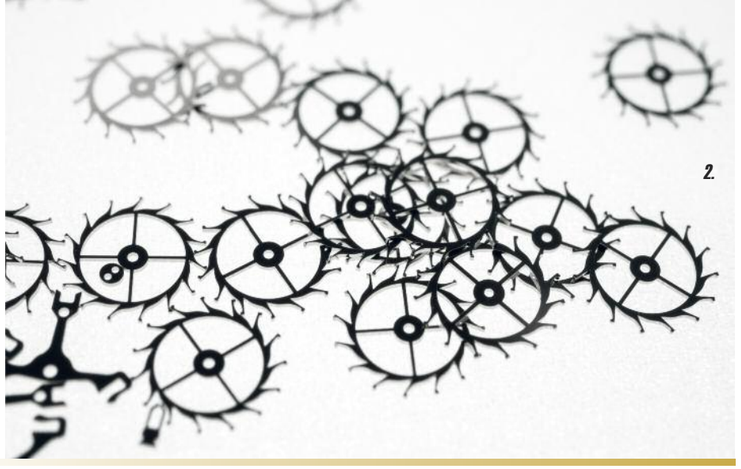
Aesthetical watch engraving

Audemars Piguet
Millenary Frosted Gold Aventurine Dial

Multietch SA in Saignelégier, canton of Jura, is a company specialized for over 30 years in the engraving and precision chemical etching by photolithography. Using sophisticated processes, Multietch SA puts its know-how to the service of watchmaking, medical, optical, food industries and aerospace.

High precision engraving, etching and more

1



2

Founded in 1987 by Jean-Philippe Frésard and Antonio Mendez, Multietch SA was taken over in 2011 by a young and dynamic leadership composed of David Mazzoni and Emile Eichenberger.
About thirty employees are divided into five departments that are chemical engraving, chemical machining, electroforming, optical encoders and LIGA.
In 2020, Multietch built a new building with more than 1500 m² of operating space. Ultra-modern premises enable us to guarantee quality and technical expertise.

«Elegance in the technique. This is our motto.»

David Mazzoni and Emile Eichenberger, Directors

«Elegance in the technique» is the company's motto since because Multietch works as well in watch engraving where criteria are most the aesthetical side, as for the medical industry which requires traceability and precision on manufactured components.
Thereby, our manufacturing technique with its advantages can produce aesthetical parts with elegance.

Reactivity, quality and services, are the key words of Multietch.
We want to remain at the cutting edge of innovation and new technologies. Our company focuses its activities on five different lines of business.

- Chemical machining: Although this process has been proven for more than half a century, it is still unknown to many people. Chemical machining is mainly used for the creation of filters, springs, electronic contacts as well as particularly thin products with bars or forms with complex geometries.
Furthermore, this technique allows us to machine almost all metals without altering their initial physical properties.

- Electroforming: an alliance of chemical manufacturing and electroplating, this technique consists in structuring a piece by depositing pure nickel with precision. Such thoroughness allows the realization of prototypes as well as series of flat pieces with complex shapes, most of the time delicate, hard and thin.

- Optical encoders: chrome glass etching is mainly used for the production of encoders discs. These are intended for motor piloting and for monitoring positioning of machine axis.

- Etching chemical, laser and mechanical: whether the etching is technical or decorative, Multietch SA enhances the watch components with elegance. This kind of etching also helps to fight counterfeiting.

- LIGA: the new kid of Multietch! LIGA is a process used to manufacture 3D nickel microstructures. Its use can be very extensive, such as for the manufacture of timepieces, micro-mechanics, microelectronics and many other areas. It's possible to reach a precision of 1 micron using this technique.

We want the environment to remain a central focus of our policy. Thanks to our ultra-modern plant we recycle half of the water we consume every day and reuse it in production. Our latest generation building limits the environmental impact. In addition, we recycle more than 80% of our waste.

www.multietch.ch

3

1. Aesthetical watch engraving.

2. LIGA technique.

3. Chemical machining.

A family history of more than 70 years, Décovi SA is specialized in screw machining and high-precision machining. The company from the Swiss Jura successfully diversifies its activities while remaining the main reference for oscillating weights for the major watch brands.

The oscillating weight, magic of the autonomous energy

1.

2.

1. Examples of oscillating weights for an automatic watch.

2. Examples of screw machining parts for a diverse range of industries.

3. Example of medical component: housing for hand prosthesis.

Founded in 1947 in Vicques, in the Swiss Jura, by Denis Chèvre, Décovi specialised at the time in screw machining. Nearly three quarters of a century later, Décovi now has a factory larger than 4,800 m² and employs around one hundred people.

«Every day is a new challenge for Décovi because our values require us to be more and more precise and efficient on an ever smaller and more complex scale.»

Claude Chèvre, CEO

In 2009, Décovi joined the Acrotec Group, a federation made up of around 20 companies and 18 production sites located in Switzerland, France and the United States. This federation allows for real technological, human and innovative synergies between these different companies thanks to the group's R&D department.

Décovi machines components of all levels of complexity using precision screw machining, CNC turning and CNC milling processes using a variety of materials and dimensions. Today, Décovi has a fine reputation among the largest watch brands in the field of oscillating weights.

Décovi also distinguishes itself in the high-precision market by its ability to provide finished parts that are as close as possible to the requirements and satisfaction of its customers, thanks to high-performance processes that comply with high-quality standards.

This quality, traceability and durability has been legitimized by the ISO certification 9001 (quality management systems) since 1996, ISO 14001 (environmental management systems) since 2006 and ISO 13485 (medical devices) since 2009. These are further assets in a market where customers are becoming more and more demanding in terms of traceability and concern for the environment. The same is true for the ISO 13485 certification, which allows Decovi to position itself clearly regarding the regulatory standards for the production of medical devices.
Throughout its history, Décovi has expanded its production range in multiple fields. However, watchmaking remains the dominant sector of the company thanks to the significant production of oscillating masses. As the true heart of the automatic caliber, the oscillating weight actively participates in the magic of the autonomous and individual energy of each watch.

«The most famous brands in the luxury watch industry trust us with the production, engraving and decoration of these oscillating weights,» explains Claude Chèvre, CEO of Décovi. «We produce about one million pieces per year, and we supply more than two hundred models of weights to about one hundred watch manufacturers.»

The oscillating weight is one of the most prominent components of the movement, especially with the trend of open case backs. Further this way, Décovi has a know-how in adding decoration (*colimaçonnage*, *côtes de Genève*, strapping, satin-finishing, surface treatment, sparing and pad printing), laser engraving, colouring, as well as supplying and assembling the ball bearing on the weights.

Décovi's screw machining department supplies parts with a diameter between 4 mm and 65 mm in different materials (stainless steel, titanium, brass, aluminium, plastic, etc.).

Décovi thus offers highly diversified products and manufactures parts also in the fields of Medtech, connector technology, electronics, aeronautics, mechatronics, defense, micromotors or industry in general. With its unique expertise in the field of very high precision machining and its ability to adapt its production to the most demanding regulatory standards, Décovi is clearly aiming for strong growth in the medical field and a permanent improvement of its productivity in order to satisfy its loyal customers and attract new prospects.

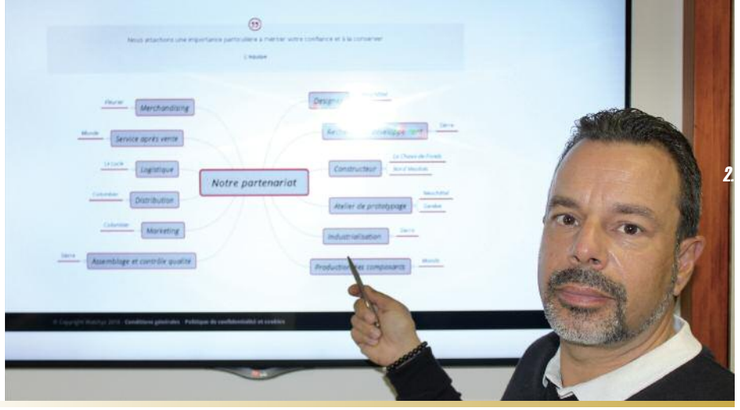
www.decovi.ch

3.

As successive crises unfolded, watchmaking and watchmakers had to constantly adapt and reinvent themselves. One path led their know-how into new fields: micro- and nanotechnologies in particular are eminent heirs to the watchmaking tradition of precision and reliability. Yann Zufferey is CEO of *YZ Production Horlogère SA*, based in Valais on the fringes of traditional watchmaking Switzerland. He provides us «live» with an interesting summary of this sharing stage in the history of watchmaking.

Dealing with time prepares to deal with change

1



2

1. *The technical know-how developed by the watchmaking sector has proved to be of very wide applications.*

2. *Yann Zufferey wants his company to stand at the heart of an ever more open network of skills.*

A watchmaking workshop, operators at their workbench handling traditional tools, others working around machines. We could be in the «Arc jurassien», maybe second half of the 20th century, were not some high-tech digital equipment. And also, beyond the windows, we do not see the soft green relief of the Jura, but vines in autumn gold against a backdrop of snow-covered alps. We are in Sierre, canton of Valais, some two hours away from the Jura where the Swiss and French watchmaking industry flourished over the last two centuries.

«With the COVID crisis, I imagined a business model opening our watchmaking infrastructure and employees to other industrial sectors.»

Yann Zufferey, CEO

Yann Zufferey welcomes us in the premises of *YZ Production Horlogère SA*, which he manages. «My great-uncle, René Zufferey, initiated the company in 1974 when the *Société Anonyme des fabricants suisses d'Horlogerie (SAH)* entrusted him with its newly created mechanical movement assembly branch in Sierre. He then took over the entity in 1986 under the name of *Production Horlogère* and focused on the assembly of luxury watches, complete casing, assembling of bracelets, final checks and packaging». Certified in precision mechanics in 1991 at ETA Swatch Group in Fontainemelon, near Neuchâtel, Yann Zufferey became the director of *Production Horlogère* in 1996, aged 24, with his great-uncle accompanying him. «Our current premises - a full floor of an administrative building - were invested in 2000».

Production Horlogère is now approaching its 50th anniversary, with an assembly capacity of 3,000 - 4,000 watches per week in the medium and high-end range, while offering complete expertise in the industrial and technical improvement of products as well as consulting for new projects. «In 2011, I added a second company to our business, WatchYZ Sàrl, in a complementary register», explains Yann Zufferey. «On the one hand, the new company offers the assembly of watches for foreign brands in accordance with the Swiss Made principle. And on the other hand, thanks to our skills and my network of partners, it offers the creation of "Private Label" collections from A to Z, from design, construction and prototyping to laboratory tests, pre-series and series, plus logistics, packaging and distribution».

A turning point

Adding to all the turbulences surrounding the Swiss franc, the Hong Kong crisis, the success of connected watches, the introduction of the new Swiss Made label, etc., this great dynamic experienced in spring 2020, a two-month halt due to COVID-19. «This new crisis has prompted me to imagine a business model that can make our infrastructure and our specialized employees available to other industrial sectors». Kind of a replay, small version, of an important episode in the history of Swiss watchmaking from the 1980s: one current flagship of Swiss research in micro- and nanotechnology, the Swiss Centre for Electronics and Microtechnology - the CSEM - was born in Neuchâtel from three entities dedicated to watchmaking research in a merger planned by the Swiss government. The aim was to take the shift toward new technologies by relying on the techniques and know-how developed in the watchmaking industry. The preservation of knowledge, practices and tools through their fruitful applications to other sectors of the industry created in return a favourable context in which Swiss watchmaking reinvented and superbly re-launched itself.

In the same way, on his own scale, Yann Zufferey is now making his infrastructures and team available for other adventures. «Our premises ensure cleanliness, hygrometry and air-conditioning in line with watchmaking standards and thus they can accommodate industrial activities in the fields of electronics, medicine, pharmaceuticals, precision mechanics, etc. without any trouble ». Yann Zufferey's target clientele are in particular companies wishing to subcontract part of their production and startups wishing to move from project study to the industrialization of their product. «Here again, my network of partners is useful, for research and development, prototyping, pre-production, industrialisation and mass production.»

A dynamism full of passion, with deep roots, that we understand still better knowing Yann Zufferey's motto: «Nothing is eternal, except change»...

www.production-horlogere.ch
www.watchyz.ch

Jaeger-LeCoultre The Master Grande Tradition Répétition Minutes Perpétuelle stems from a century and a half of experience in complication watches accumulated by the Vallée de Joux watchmaking house.

BY ISABELLE CERBONESCHI - WATCHES THE GUIDE

The mastery of chiming watches

When you listen to Jaeger-LeCoultre's Master Grande Tradition Répétition Minutes Perpétuelle striking the hours, quarter-hours and minutes, the first surprise is how powerful the sound is. And the second is its delicacy. It combines strength with lightness. In order to develop this grande complication watch, Jaeger-LeCoultre drew on its 149 years of experience in the field. Today, few manufactures can boast such a heritage and such expertise. To achieve this result, the manufacture's research and development department perfected a system of innovative gongs with a clear and powerful sound, reminiscent of old striking pocket watches. These gongs with square cross-sections, struck by articulated trebuchet hammers, resound throughout the case thanks to an ingenious system that enables them to occupy the entire space.

A mechanical amplifier

The gongs are not placed on top of each other: they coil around the movement on one side, making a near-complete rotation before pivoting and switching sides, where each gong then proceeds to arch upwards. The space in which the sound spreads is thus optimised, and the acoustics amplified by the proximity of the gongs to the case, like a soundbox. This timepiece couples two masterpieces of construction and miniaturisation: a minute repeater and a perpetual calendar, another important complication that displays the date, the day and the month in accordance with the length of the various months and leap years. Perpetual calendars are usually handwound, but the Master Grande Tradition Répétition Minutes Perpétuelle is driven by the self-winding 950 calibre. The rotor is concealed within the movement, allowing owners of this grande complication timepiece to fully admire the beauty of its core and the high-quality finish adorning each of its components. To safeguard the functioning of the movement, the manufacture has designed a security zone that appears in an aperture close to the axis of the hours and minutes hands between 10 pm and 1 am. This valuable indication warns the owner not to adjust their watch during this period of time. It also reminds them of just how precious the timepiece on their wrist is.

The Reverso's new finery

There are few watches that have enjoyed such longevity. The Reverso appeared in the 1930s, and its origin springs from one of the best-known anecdotes in watchmaking. During a polo match in India, a British Army officer approached Swiss businessman César de Trey holding a broken watch. He set him a challenge: to invent a watch that was able to withstand the brutality of a polo match. The businessman took the officer at his word and contacted the only Swiss manufacture capable of achieving such a feat. In 1931, the Reverso was born. Its singularity, functionality and timeless Art Deco design have enabled it to endure throughout the decades. In 2019, the Jaeger-LeCoultre manufacture presented three new interpretations of this horological icon: a burgundycoloured Reverso Tribute Small Seconds, a Reverso One Duetto, the famous women's model set with diamonds on both dial faces, and a Reverso Tribute Duoface, which offers two time zones, one on each dial face. The limited edition Reverso Tribute Duoface Fagliano Limited in rose gold is worn with a cordovan leather strap, hand-stitched by Casa Fagliano, the world's most distinguished maker of polo boots. An elegant nod to the Reverso's origins.
www.jaeger-lecoultre.com

1. Innovative system composed of two gongs welded together, curving around the movement in the same direction.

2. Master Grande Tradition Répétition Minutes Perpétuelle in white gold with blue guilloché enamel dial, limited to 30 pieces.

3. Reverso Tribute Duoface Fagliano Limited in rose gold with blue front dial and silvered grey back dial featuring Clou de Paris guilloché motif.

4. The 'Care Program': a digital platform for customers and an international eight-year guarantee.

Longines The brand from Saint-Imier has always applied two enduring concepts to its production: precision and elegance. Since 1832, these two watchwords have become the symbols of Longines' success.

BY CHRISTOPHE ROULET - WATCHES THE GUIDE

All about tradition

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There is no trifling with history at Longines. And for good reason, too: with 187 years of existence, the house commands respect, especially as it is now one of today's leading Swiss watch brands. Longines has cultivated this attachment to its heritage since its inception. It was founded in Saint-Imier in 1832 as a simple 'watchmaking establishment', and quickly realised the need to make an inventory of its production. Today this is an essential concern, but back then, this was no mean feat. True to its visionary spirit, the firm has systematically recorded all its watches since 1867, first in its 'établissage' ledgers, then in microfiches, and finally on computers. Since 2012, it has been using the LEA (Longines Electronic Archives), a unique database that collates all archived material about each watch, to provide information to dozens of customers on a daily basis. Given the incalculable number of Longines watches scattered around the world today, it is easy to grasp how monumental a task this is.

A play on contrasts

Faithful to its heritage yet looking to the future, Longines is omnipresent in the sporting world. The brand is official timekeeper for an array of competitions in equestrian sports, gymnastics, archery and downhill skiing, not to mention the Commonwealth Games. But it is also a master in cultivating contrasts. Its roadmap, for instance, presents a dichotomy between existential elegance and an almost military-like strategy. Longines is also the contrast between dynamic, high-tech sports equipment and age-old mechanical watchmaking. So it is hardly surprising to find similar diversity in the brand's collections, where sport and classicism go hand-in-hand with femininity and tradition. In this last category, Longines has some hidden gems that «have accompanied exploration missions to unknown parts of the globe, withstood extreme weather conditions, participated in the opening of new airways and the setting of new aviation records, and navigated on raging seas».

On vintage wings

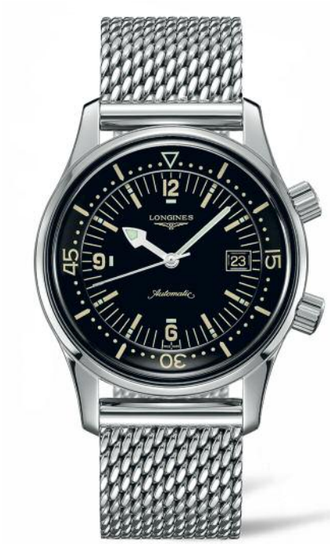
These models that have marked the history of watchmaking have now been updated for the Heritage collection. We thus discover the Lindbergh Hour Angle watch, developed by Longines in collaboration with the aviator Charles A. Lindbergh, who successfully completed the first non-stop solo flight across the Atlantic from New York to Paris in 33 hours and 30 minutes in 1927. «Confirming its essential contribution to air navigation at the time, the Lindbergh watch helped set a large number of aviation records,» states the house. In the same vein, the Longines Weems Second-Setting Watch has become an essential accessory for pilots and sailors. It is based on an invention by US Navy officer Captain Weems that made it possible to synchronise a watch to the nearest second without disrupting the mechanism, using a time signal broadcast by radio. For military purposes, Longines also developed the Longines Avigation Watch Type A-7 1935 for the Americans in 1935, followed by timepieces for the British Royal Air Force in the 1940s that inspired the present-day Longines Heritage Military. Diving with the 1960s Legend Diver, sports performance with the 1954 Conquest, and emerging elegance with the 1957 Flagship all still nourish the themes of this collection, whose retro accents keep the Longines winged hourglass flying high.

www.longines.com

1. The Longines Avigation Watch Type A-7 1935 in steel with white lacquered dial and brown alligator-leather strap.

2. Flagship Heritage – 60th Anniversary 1957-2017 in steel with silvered dial and brown alligator-leather strap.

3. The Longines Legend Diver Watch in steel with black lacquered dial and metal Milanese mesh bracelet.



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Although **Patek Philippe** is a leading name in «grande complication» watches, it is equally renowned for its 'petite complication' timepieces, notably its calendar watches and women's range.

BY CHRISTOPHE ROULET - WATCHES THE GUIDE

1.

The power of seduction

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«The Internet is a very good tool to be educated, but it's not the right tool to sell a Patek Philippe.»

Thierry Stern, CEO of Patek Philippe

Very often, Patek Philippe's truly exceptional models are focused on grandes complications, such as the Grandmaster Chime Reference 6300, which has two dials, no fewer than 20 complications (including five chiming ones) and 1,366 parts. And this wasn't even a oneoff! Presented in 2014 to celebrate the manufacture's 175th anniversary, it was incorporated into the current collections two years later. But in the early 1990s, Patek Philippe also began to concentrate on what it dubbed 'useful' complications, such as annual calendars, universal time and second time zones. In parallel, it also launched the Twenty~4®, its first women's watch in diamond-set steel, in the same period. Patek Philippe thus also became a benchmark for useful complications, notably with highly popular models offering simple, annual and perpetual calendars and a weekly calendar.

Pioneer of calendars

The advantages of an annual calendar are obvious. Requiring a simple correction once a year at the end of February, it is therefore less complex than a perpetual calendar and consequently more affordable, while still leaving room for original dial decorations. Yet the patented movement equipping Reference 5035, which is readily considered to be the first true annual calendar, made Patek Philippe a recognised pioneer in the discipline. That was back in 1996, and since then this complication has become a trusty constant in the house's catalogue, available in more than 20 different versions. One of these includes Reference 5235, which was released in 2011 and combined Patek Philippe's patented annual calendar mechanism with a regulator type display that dissociated the hours, minutes and seconds hands in a highly unusual way, all the while offering day, date and month calendars in separate apertures. The model returns this year in rose gold with a two-tone graphite and ebony-black dial. While this watch – «a tribute to the precision clocks that were long used to display the exact time in watchmaking workshops and astronomical observatories» – offers perfectly mastered retro charm, the same is also true of another new timepiece: the Calatrava Weekly Calendar Reference 5212A in steel, which introduces a new calendar function (the week number) in addition to the day and date displays. Inspired by a one-of-a-kind piece made in 1955, the aesthetics of this creation have a vintage feel that is highly popular today. As evidence of this, the house has created a specific typography based on handwriting, with letters and numerals that are all different and unique, in a nod to the notes written in a diary.

3.

1. Calatrava Weekly Calendar Reference 5212A-001 in steel with silvered opaline dial and specially designed typography based on hand-written numerals and letters.

2. Annual Calendar Regulator Reference 5235/50R in rose gold, with two-tone dial in graphite and ebony black.

3. Twenty~4 Automatic Reference 7300/1200A-001 in steel set with 160 diamonds, with blue sunburst dial and steel bracelet.

A feminine anniversary

Without the Twenty~4®, Patek Philippe would certainly not be where it is today. The house's iconic women's watch is now celebrating it 20th anniversary, providing the perfect opportunity for the manufacture to give it a new lease of life with the Twenty~4 Automatic, which abandons rectangles and quartz for the curves of a 36 mm case in diamond-set gold or steel, and the reliability of a self-winding 324 S C calibre. It took no less than five years of development to prepare this new Twenty~4®, notably to adapt the calibre to a smaller case and to hone its appearance right down to the tiniest of details. As the house's boss, Thierry Stern, summed up when it was presented in Milan: «It had to be perfect. It had to be a Patek Philippe!».

www.patek.com

The radical magician of modern watchmaking loves contemporary art, making for some unusual partnerships. From famous institutions to renowned artists, **Richard Mille** stakes his own unique claim to some uncharted creative territory.

BY OLIVIER MÜLLER - WATCHES THE GUIDE

Richard Mille has art on his mind

Sunday 30th June, Chantilly, North of Paris. A castle dating back to 1358, an immense park and gardens designed by Le Nôtre, filled with impressive hats and families wearing their Sunday best. With each step, they pass a vintage Bugatti, a forgotten Facel Vega or a McLaren prototype. What could be mistaken as a background of a Dali is habitual for Richard Mille. The Richard Mille Arts & Élégance car competition is (largely) his own creation. It was founded by his friend Patrick Peter (from Peter Auto, a leader in classic car races) after a discussion together. But the event offered a unique twist, placing art and mechanics on an equal footing.

In the beginning, a soupçon of Picasso

New observers might have been surprised: Richard Mille, the high priest of 21st century watchmaking, champion of mechanical sports, apostle of the ultra-high-tech... converted to patron of the arts? The truth is more complex. But not, however, entirely unexpected. There were a few clues. The Éditions Cercle d'Art publishing house was one of them. Part of the Richard Mille group, it is the long-standing publisher of many monographs on contemporary artists, including Picasso, who was an early supporter. Then there's the brand's several partnerships with artists from diverse backgrounds. One of these is Cyril Kongo. A true work of art for the wrist, his RM 68-01 Tourbillon transposes his world and the language of street art to the heart of a watch movement. His extraordinary work of art required nearly a year of research simply to develop the airbrush and paint that was needed!

Transposing an artistic vocabulary onto the infinitely small is a common denominator with the creations of another Richard Mille artist, the actress Michelle Yeoh, who was also the brand's first female partner. Her RM 051 illustrates the legend of the phoenix on the wrist. Adorned with diamonds, it snakes around the movement, binding the barrel, power reserve indicator and tourbillon together in an eternal cycle. Poetry and fascination emanate from this work of art, whose extreme complexity transcends feminine elegance.

Sitting down with the greats

Even this boldness was not enough to satisfy Richard Mille. After some other very targeted partnerships (Pharrell Williams, the actress Margot Robbie and the choreographer Benjamin Millepied), the watchmaker sat down with some of the world's greatest artistic institutions. But don't expect to find Richard Mille at the Louvre, it's much too historic! This man keeps his gaze looking far ahead to the future. First it was Frieze Masters and Frieze London, then New York and Los Angeles. Frieze is the most important global platform for modern and contemporary art for connoisseurs, collectors and the general public. Richard Mille immediately found his place there, for each of his watches is, in its own way, a work of art, design, sculpture and architecture. Each «Richard Mille» stimulates the perception of collectors, offering a new interpretation of the art of watchmaking in exactly the same way that a work of modern art questions traditional art, unhesitatingly questioning genres and conventions. More recently, Richard Mille laid a further claim to artistic territory through a partnership with the Palais de Tokyo, Europe's largest centre for contemporary art, situated in the heart of Paris. With a three-year commitment, Richard Mille will be in direct contact with the 640,000 visitors that come to this international institution each year which, like the watchmaker, knows how to blur the lines between exhibitions, meetings, film projections, concerts, performances and book shop, all within a spectacular building. Innovating and upsetting conventions in an unparalleled modern setting: this could almost be the definition of a Richard Mille watch.

www.richardmille.com

1. «A work of art for the wrist», the RM 68-01 Tourbillon Cyril Kongo was created in collaboration with the French street artist.

2. A partner of several major art events, including Frieze, Richard Mille combines art with watchmaking.

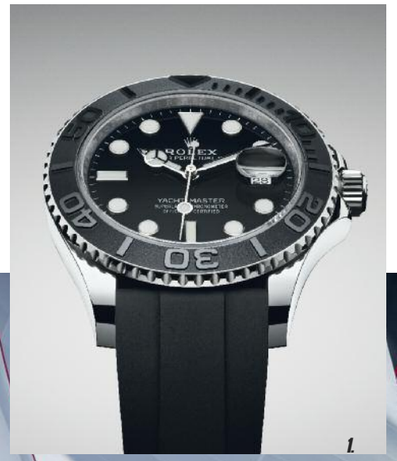
3. Cyril Kongo has brought his graphic world to the heart of the movement, using a specially developed airbrush to spray on the colours drop by drop.

4. Actress Michelle Yeoh has contributed to the development of several Richard Mille watches for women.

Rolex presents the new Oyster Perpetual Yacht-Master 42. As comfortable at sea as it is on land, this nautical timepiece encapsulates the spirit of great seafarers, the functionality of a professional tool and the style of an elite sports watch.

BY RACHÈLE MONGAZON - WATCHES THE GUIDE

Rolex in full sail



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1. Oyster Perpetual Yacht-Master 42 in 18-carat white gold with matt black ceramic Cerachrom insert, black lacquered dial and Oysterflex strap.

2. The Maxi Yacht Rolex Cup in Porto Cervo, organised by the Yacht Club Costa Smeralda (YCCS) in partnership with Rolex.

3. The Oyster case is water-resistant to 100 metres and features a screwed-down Triplock crown protected by shoulders on the case middle.

4. Oysterflex strap and Oysterlock safety clasp patented by Rolex.

Since the 1950s, Rolex has been part of some of the greatest seafaring adventures. At the time, it developed its first links with prominent sailing clubs and set sail with yachtsmen whose bravery and determination it supported. It takes both courage and common sense to confront the waves, as well as faultless timekeeping with the use of an accurate and robust timepiece. Adventurers from all horizons deliberately chose to wear a Rolex on their wrist. One such navigator was Sir Francis Chichester, who was the first to complete a solo round-the-world sailing trip in 1967. Talking about his Rolex, he maintains: «While I was sailing around the world aboard the Gipsy Moth IV, my Rolex watch received several violent impacts without being damaged. I can't imagine a more robust watch». In this spirit of uncompromising performance, the Yacht-Master range, released in 1992, celebrates the nautical achievements and passion that unite Rolex with the world of sailing.

New wave

A new member has joined the Yacht-Master crew. In addition to its unprecedented 42 mm diameter, two innovations mark the arrival of the Oyster Perpetual Yacht-Master 42: its case is crafted from 18-carat white gold – a first for the range – and its Oysterflex strap is equipped with the new Rolex Glidelock extension system. In all other respects, the new recruit proudly displays the hallmarks of the collection. Its case with rounded contours is topped with a bidirectional rotating bezel with matt black Cerachrom insert. This high-tech, scratch- and corrosion-resistant material demonstrates Rolex's ability to manufacture ceramics in intense, durable colours. The bezel's raised graduations and numerals ensure precise readings, while its notched surround is easy to grip. Perfectly waterproof, the Oyster case can withstand depths of 100 metres due to its hermetically screwed-down case back and Triplock crown. The scratch-proof sapphire crystal, with Cyclops lens over the date at 3 o'clock, protects a black lacquered dial with Chromalight display legible in the dark, and large, luminous hands and hour-markers.

Crammed with technology

The new Oyster Perpetual Yacht-Master 42 holds a high-precision 3235 calibre, developed and manufactured by Rolex. This avant-garde self-winding mechanical movement is protected by several patents. Its assets? Greater precision and autonomy (70 hours), better resistance to impacts and magnetic fields, and enhanced reliability and ease of use. To achieve this, it incorporates a Chronergy escapement that is insensitive to magnetic fields and combines optimum energy efficiency with safe operation. Its Parachrom balance spring is 10 times more accurate than a traditional balance spring in case of impact, and guarantees smooth operation. This is also true for its oscillator mounted on Paraflex shock absorbers.

Steeped in style

As functional as it is elegant, the Yacht-Master 42 is fitted with an Oysterflex strap that combines the sturdiness of a metal bracelet with the aesthetics and comfort of a rubber strap. Its two ends are made up of flexible metal blades that are overmoulded with black elastomer. The Oysterlock safety clasp prevents it from opening unexpectedly, while the new integrated Rolex Glidelock extension system allows the length of the strap to be adjusted without any tools. Lastly, like all Rolex watches, the Yacht-Master 42 is delivered with the brand's own Superlative Chronometer certification to guarantee its high performance, as well as a five-year international warranty.

www.rolex.com

4.

RICHARD MILLE
RM 07-01 Ladies / CHF 216,000
Tonneau-shaped carbon TPT® case, dimensions 45.66 x 31.40 x 11.85 mm, sapphire crystal case back. Water-resistant to 50 metres. Skeletonised automatic mechanical movement, manufacture calibre CRMA2, grade 5 titanium mainplate and bridges, variable geometry rotor, variable inertia balance, fast rotating barrel. Power reserve of about 50 hours. Functions: hours, minutes. Carbon fibre flange, luminescent hour-markers. TPT® carbon and grade 5 titanium bracelet, 200 components, 29 grams.

ROGER DUBUIS
Excalibur Blacklight / CHF 99,000 / *Limited edition of 88 timepieces*
18-carat white gold case, 42 mm diameter, bezel set with 102 diamonds (~1.1 carats), sapphire crystal case back. Water-resistant to 50 metres. Skeletonised automatic mechanical movement with micro-rotor, calibre RD820SQ, 166 components, 28,800 vibrations/hour. Power reserve of 60 hours. Functions: hours, minutes. Flange with rhodium-plated hour-markers, micro-sapphire tubes sensitive to UV light, 18-carat white gold hands. Navy blue alligator-leather strap, adjustable white gold folding clasp.

PARMIGIANI FLEURIER
Toric Retrograde Perpetual Calendar / CHF 69,000
18-carat rose gold case, 42.5 mm diameter, sapphire crystal case back.
Water-resistant to 30 metres. Automatic mechanical movement, manufacture calibre PF333, 414 components, two seriesmounted barrels, 28,800 vibrations/hour. Power reserve of 50 hours. Functions: hours, minutes, seconds, retrograde perpetual calendar, precision moon phase. Slate «Rice Grain» guilloché dial, blue aventurine moon phase, rose gold applied hour-markers and luminescent javelin hands.
Hermès Havana-brown alligator-leather strap, rose gold folding clasp.

AUDEMARS PIGUET
Millenary Frosted Gold Aventurine Dial / CHF 53,000
Satin-brushed and hammered 18-carat white gold case, 39.5 mm diameter, crown set with a translucent sapphire cabochon, sapphire crystal case back. Water-resistant to 20 metres. Manually wound mechanical movement, manufacture calibre 5201, 157 components. Power reserve of 49 hours. Functions: hours, minutes, small seconds. Off-centred dial, blue aventurine small seconds counter, rose gold applied hour-markers and hands. 18-carat white gold bracelet, folding clasp. Comes with a second black alligator-leather strap.

HUBLOT
Big Bang Sang Bleu II King Gold / CHF 44,900 /
Limited edition of 100 timepieces
King Gold 18-carat rose gold case, 45 mm diameter, bezel with hexagonal decor, six H-shaped titanium screws, sapphire crystal case back. Water-resistant to 100 metres. Automatic mechanical movement, manufacture calibre Unico HUB1240.MXM, 330 components, 28,800 vibrations/hour. Power reserve of 72 hours. Functions: hours, minutes, flyback chronograph, date. Matt black dial, polished skeletonised hands. Black rubber strap designed by Sang Bleu, folding clasp in 18-carat King Gold.

Source: Watches The Guide

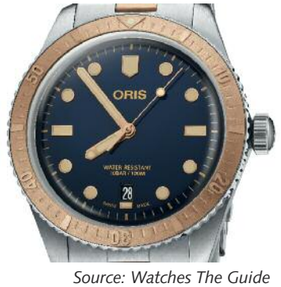
HERMÈS
Arceau L'heure de la lune / CHF 26,000
18-carat white gold case, 43 mm diameter, sapphire crystal case back. Water-resistant to 30 metres. Automatic mechanical movement, manufacture calibre H1837, 193 components, 28,800 vibrations/hour, with exclusive «L'heure de la lune» module, 117 components. Functions: hours, minutes, double moon phase (Northern and Southern Hemispheres), date. Aventurine dial, white lacquered mobile counters, southern moon with Pegasus transfer, northern moon with a transfer of the moon's surface, blued hands. Abyss-blue matt alligator-leather strap, white gold folding clasp.

JAEGER-LECOULTRE
Atmos Transparente / CHF 9,950
Glass case, dimensions 145 x 185 x 250 mm, rhodium-plated and satin-brushed base. Manually wound mechanical movement, manufacture calibre 563, 217 components, one degree in temperature variation is enough to power the Atmos for two days. Functions: hours, minutes. Transparent glass dial, transferred hour-markers and black hands.

CARTIER
Santos-Dumont / CHF 3,850
Steel case, 43.4 mm wide, beaded crown adorned with a blue cabochon-shaped spinel. Water-resistant to 30 metres. High-autonomy quartz movement (~ six years). Functions: hours, minutes. Silvered satin-brushed sunray dial, Roman numerals, blued-steel sword-shaped hands. Navy blue alligator-leather strap.

LOUIS VUITTON
Tambour Monogram 34 mm / CHF 2,580
Steel case, 34 mm diameter. Water-resistant to 100 metres. Quartz movement. Functions: hours, minutes, seconds. Grained dial with Monogram motif, hands with Super-LumiNova®, yellow central small seconds. Interchangeable Monogram fabric strap, Louis Vuitton patented system.

ORIS
Oris Divers Sixty-Five / CHF 2,200
Steel case, 40 mm diameter, bronze bezel with minute scale, screwed crown and case back. Water-resistant to 100 metres. Automatic mechanical movement, calibre Oris 733, SW 200-1 base, 28,800 vibrations/hour. Power reserve of 38 hours. Functions: hours, minutes, seconds, date, stop seconds. Blue dial, luminescent rose-gold-plated hour-markers and hands. Steel and bronze bracelet, folding clasp.



Source: Watches The Guide

MiCRONARC Western Switzerland Micro-nanotech Cluster

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
For research in Microtechnology
Ruelle DuPeyrou 4, CP 2353
CH-2001 Neuchâtel - Switzerland
Tel. +41 32 720 09 00
www.micronarc.ch

The Micronarc team

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

Dr Stefan Hengsberger
Professor, EIA Fribourg

Jacques Jacot
Professor Emeritus EPFL

Reynold Jaquet
Member of the Berne Precision Cluster Committee

Georges Kotrotsios
Vice President CSEM SA

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

Guillaume von Roten
Innovation project manager, CimArk

Alain Codourey
Managing Director Asyril SA

Frédéric Chautems
Plant Manager MPS Watch

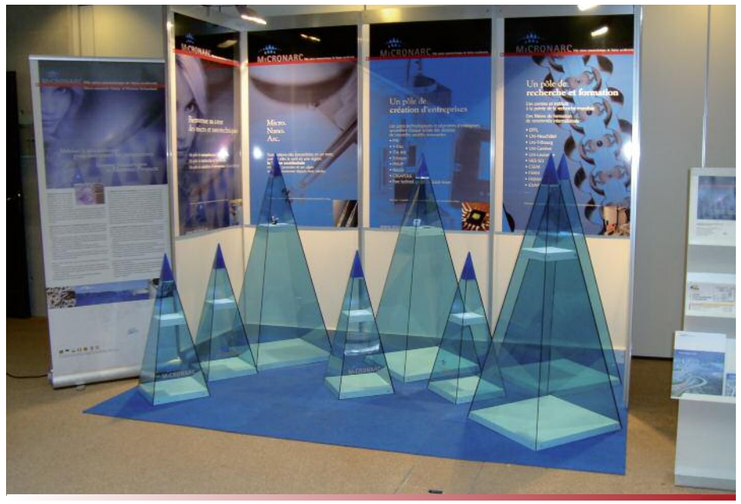
Max Monti
Research Director, Haute Ecole ARC

Martial Racine
ad personam

Philippe Fischer
Director FSRM

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

Contact
Danick Bionda
Secretary General



MICRONARC | Western Switzerland Micro-nanotech Cluster

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 New Regional Policy (NPR).

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Economic Affairs SECO

Micronarc Alpine Meeting

12th edition

mAm 2021

The Microproducts Annual Meeting

4 – 5 October 2021
Villars-sur-Ollon, Switzerland

Following in the success of the first 11 editions, The Micronarc Alpine Meeting 2021 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.mam2021.ch**

EARLY PROGRAM See web site for the most up-to-date information, including confirmed speakers to date.

Sunday 3 October 2021

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

Monday 4 October 2021

09:00-09:30 **Welcome Session**
Danick Bionda, Secretary General, Micronarc
Prof. Dr Volker Saile, Karlsruhe Institute of Technology

09:30-10:15 **Invited Keynote on the Future of Micro-manufacturing I**
Prof. Dr. Roland Zengerle, IMTEK (Germany)

10:45-12:00 **Micro-manufacturing Applications I – Watchmaking**
Sylvain Dolla, CEO, Tissot SA (Switzerland)
Pierre-François Louvigné, Sales and Marketing Director, Silmach (Switzerland)
More speakers to be announced

13:30-15:00 **Micro-manufacturing Applications II – Medtech**
Erika Györvary, Technology Coordinator, CSEM, (Switzerland)
Dr. Bernd Vogel, Endosmart (Germany)
Dr. Alexios Paul Tzannis, Business Development Manager Life Science and Diagnostics, IMT Masken und Teilungen AG (Switzerland)
Dr. Andreas Hogg, CEO, COAT-X and **Dr. Julia Hoeng,** PMI Science (Switzerland)

15:30-17:15 **SENSORS**
Benedetto Vigna, President, Analog, MEMS & Sensors Group, ST Microelectronics (Italy/Switzerland)
Dr. Nicole Ruiter, Ultrasound Computer Tomography, Karlsruhe Institute of Technology (Germany)
Dr. Markus Ulm, Vice President Engineering (BST/NE), Bosch Sensortec GmbH (Germany)
Prof. Tamim Asfour, Karlsruhe Institute of Technology / KIT (Germany)

19:00 *Conference Dinner - Meet in hotel lobby at 19:00*

Tuesday 5 October 2021

09:00-09:45 **Invited Keynote on the Future of Micro-manufacturing II**
Prof. Barbara Rothen-Rutishauser, Adolphe Merkle Institute, University of Fribourg (Switzerland)

10:30-12:15 **Novel Manufacturing**
Prof. Yves Bellouard, GALATEA LAB, EPFL (Switzerland)
Prof. Dr.-Ing Andrea Iris Schäfer, Director - Institute for Advanced Membrane Technology (IAMT), Karlsruhe Institute of Technology (Germany)
Frédéric Loizeau, Business & Technology Development Manager, CSEM
Prof. Dr. Jürgen Brandner, Karlsruhe Nano Micro Facility KNMF, KIT (Germany)
Dr. Thomas Bertolini, Managing Director, Dr. Fritz Faulhaber GmbH & Co. KG (Germany)

14:00-14:45 **Invited Keynote on the Future of Micro-manufacturing III**
Speaker to be confirmed

14:45-15:00 **Final Remarks**

15:00 *Conference adjourns - Farewell reception in hotel lobby*

Micronarc - The communication platform of a unique hub of competence

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