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PORTRAIT OF A CEO

The home of precision

DIGITALIS

Robots revive competitiveness
of "Factory Switzerland"

START-UP

Five new, ambitious companies
introduce themselves

LIVING / CULTURE / TOURISM

Smart Assistants – enhancing
your holiday experience

Small factory – big vision

Content

COVER STORY

Small factory – big vision

4–7

START-UP

NaturLoop

TEACHY

Peerdom

SurgeonsLab

Swiss Cluster

8/9

PORTRAIT OF A CEO

The home of precision

10/11

HIDDEN CHAMPION

Meraxis: global player in the polymer industry

12/13

DIGITALIS

Robots revive competitiveness of “Factory Switzerland”

14/15

LIVING / CULTURE / TOURISM

Smart Assistants – enhancing your holiday experience

16–18

COMPETITION

Tourist highlights in the Interlaken-Jungfrau Region

19

ADMINISTRATION FOR CITIZENS

Feel free to ask the Digital Administration Secretariat

20

NEW ARRIVALS

New arrivals in the Canton of Bern

21

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Hiking gems in the Bern region

22/23

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Dear reader,

Switzerland is one of the most innovative countries in the world. Whether we are at the forefront of every single innovation is not really the issue. What is more important is that we constantly improve and that industry embraces the most important trends. One particular area in which that applies is Industry 4.0 and digitalization. It is not easy to implement these innovations, particularly in traditional industries. So how can you reconcile tradition and innovation? In this issue, we asked institutes and companies in Bern how they are going about implementing Industry 4.0 and digitalization in a constructive way. The Canton of Bern supports and facilitates these projects – as an enabler, as a coaching partner and as a network partner.

In our cover story we introduce you to a project with revolutionary potential. How else would you describe a fully automated machine pool that fits on a shelf? This innovative device is currently being developed at HE-Arc in Saint-Imier. But it's not just about developing the machines, it's also about taking the project partners along on this journey into Industry 4.0 and digitalization and creating a sense of excitement about them in the region.

The SwissFactory.Group in Neuenegg already operates as a “dual factory.” People do the work during the day, and then machines and robots take over at night. Although Hans Gattlen and his team are still in the launch phase, they are confident that they will be fully operational by the autumn. This is an example of entrepreneurship and Industry 4.0 in their purest form – right here in the Canton of Bern. And it perfectly complements the Swiss Smart Factory in Biel/Bienne.

In this issue we also feature another Hidden Champion: the international trading group Meraxis, headquartered in Muri near Bern, which is committed to digitalization and is something of a pioneer in its sector. According to CEO Dr. Stefan Girschik, digital solutions create transparency and efficiency. If you haven't heard of Meraxis yet, don't worry, just read on – that's the nature of a Hidden Champion.

Of course, digitalization is even permeating our dealings with the authorities: something we are discovering every day anew as the Canton of Bern's current hardship support program is implemented. However, this is not only about pandemic support measures but about important interfaces in the canton: the Digital Administration Office is responsible for implementing the Canton of Bern's Digital Administration Strategy 2019–2022 and is therefore the central point of contact for questions on digital administration in the canton. Find out what these questions are in the Administration for Citizens column.

Join us on a deep dive into digitalization and Industry 4.0 as we present this exciting topic from some unexpected angles. I hope you will find this issue a fascinating read.

Yours truly,

Dr. Sebastian Friess

Head Official, Office of Economic Affairs

President, Bern Economic Development Agency



Small factory – big vision

An autonomous microfactory that custom manufactures products from raw materials using various processes and without human intervention while simultaneously carrying out quality assurance. A glimpse of a distant future, perhaps? But that future may no longer be all that far off, because the engineers at HE-Arc are already working on making it a reality today.

Switzerland – and especially the Jura region – is a stronghold when it comes to small components, be they for the watch industry or for medical technology. Up to now, however, these small parts have mainly been manufactured on huge machines that are massively energy-hungry, difficult to program, and all too often located abroad because of the high cost of manufacturing in Switzerland. So the engineers at HE-Arc posed themselves the question: Could we develop a small machine that saves energy and space and is agile and flexible? Professor Claude Jeannerat's team took up this challenge and presented the Micro5 at SIAMS 2016, the trade fair for future trends in the microtechnology industry. The Micro5 is a five-axis milling machine that is no bigger than a coffee machine and has power consumption measured in kilowatt hours rather than megawatt hours. Using artificial intelligence, it self-adjusts as soon as it identifies anomalies. A mini sensation, you could call it. The prototype was adopted by three different machine manufacturers who now have this product in their ranges.

From machine to MicroLean Lab

The Micro5 inspired the HE-Arc students to think about what might come next. Supposing things didn't stop with this one machine but several autonomous, building block-style micromachines were to be combined to form a microfactory? Like a smartphone with different apps. Professor Jeannerat was instantly all ears for this vision and the MicroLean Lab (MiLL) project was born. The idea behind the microfactory, the heart of the MiLL, is to turn raw materials into finished products such as main plates for the watch industry. The machines would interact autonomously and carry out quality assurance during the manufacturing process itself, thus minimizing or completely eliminating rejects. What's more, the factory would be so flexible that products could be tai-

lor-made. Everything could be manufactured to order on site, and all at market prices. Huge warehouses, excess stocks, high energy costs, and long transport distances would be a thing of the past. Manufacturing would take place in Switzerland, thereby adding to the credibility and flexibility of manufacturing here. The microfactory would be of particular appeal to jewelry boutiques, watchmaking workshops, dental practices or even hospitals, for example.

Experimental center

But many of the building block technologies needed for the MiLL do not yet exist. And that's why the people in charge expressly refer to the MiLL as an experimental center where new technologies, implementation methods and ideas from the world of artificial intelligence and digitalization in Industry 4.0 are created and verified. In this respect, they are not alone: Research into automating manufacturing processes and interconnecting different machines is also being conducted at other research institutes such as the Swiss Smart Factory, with which the players at the MiLL liaise closely and share information. The special and unique feature of the MiLL is that it is designed to manufacture parts in the submillimeter range. This poses a whole new set of challenges for developers, because in these ranges experimentation takes precedence over calculations. This research in high-precision engineering and the development of a miniaturized machine park make the MiLL the only project of its kind anywhere in the world.

The next stages

The project is divided into several stages: integration of the building block technology, interconnection of the machines, and autonomization of the microfactory. By 2025, the MiLL should be far enough developed to be able to be used by industrial companies. As it progresses, the project will offer quick wins to keep its partners happy, such as developments for logistics or technologies for machines.

There are still quite a number of challenges to be overcome before the factory is completed, which a team consisting of HE-Arc researchers, university graduates, and 25 different partners from industry is currently working on. These people bring together a wide range of skillsets, with the MiLL incorporating mechanical engineering, watchmaking, MedTech, high precision, and AI. Like the building block technologies, they must all work together optimally to achieve their goal and make the project a success. We spoke to four of the key players and found out why the MiLL is revolutionary for them.



MICRO5

It all started with this: a 5-axle milling machine that's not much bigger than a standard coffee machine.



“My focus has always been on sustainability in manufacturing.”

Professor Claude Jeannerat, Scientific Coordinator, MiLL

The main driving force behind the Micro5 and therefore the MiLL is Professor Claude Jeannerat. For him, the MicroLean Lab serves two main purposes: digitalization and sustainability. It's the latter that is Jeannerat's particular passion. "My focus has always been on sustainability in manufacturing, even when that wasn't yet on any industry's radar." Nevertheless, HE-Arc and HES-SO offered him the opportunity to develop a program on sustainability in manufacturing. This gave rise to the Micro5, and now the MiLL experimental lab is the continuation of this idea. Today, the energy and space-saving aspect is attracting a lot of interest from industry – much to Jeannerat's delight. The second key aspect, digitalization, embodies the greatest transformation potential, Jeannerat believes, especially for the partners involved in the MiLL: "The MiLL enables the partners to acquire or expand competencies in this area." Digitalization is an area in which many Swiss companies still have some catching up to do: "In digitalization and autonomization, Swiss companies still have to find their niche."

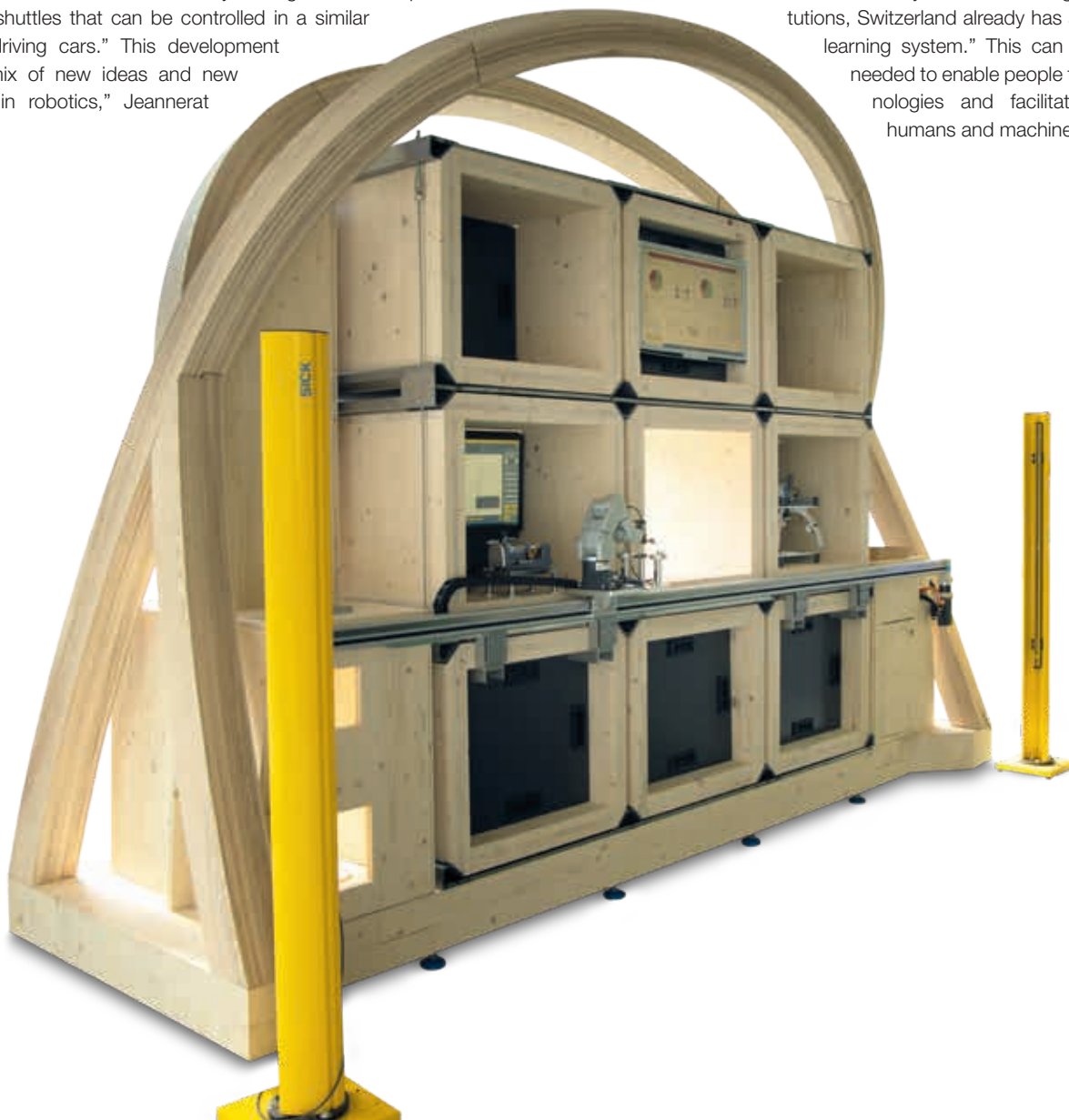
For Jeannerat, two of the biggest challenges at this stage are the development of the artificial intelligence that will enable the machines installed in the MiLL to manufacture autonomously, and transit, or how components get from one block or machine to the next. "We are currently leaning toward multiple independent shuttles that can be controlled in a similar way to self-driving cars." This development requires "a mix of new ideas and new technologies in robotics," Jeannerat concludes.



“You don't get far on your own.”

Professor Nabil Ouerhani, Scientific Lead, MiLL,
Interaction Technologies Research Group

How the machines in the MiLL work together, communicate with each other, and are operated is the area of expertise of Professor Nabil Ouerhani and his team. The engineer specializes in communication and interaction between robots, machines, and humans. The biggest challenge for his specialist field at the moment is how to orchestrate the machines, which have to be flexible and agile. It helps that most modern-day machines are equipped with standardized software allowing them to connect to other machines. And that's something that wouldn't have been possible not so long ago, Ouerhani explains: "In terms of Industry 4.0, tool and machine manufacturers have realized that you don't get far on your own and that you need to be open to collaboration." The fact that Switzerland is not yet up there among the front runners in automation and digitalization doesn't worry him. "Switzerland is pursuing a bottom-up strategy – in quite a federal way. Instead of a major national strategy, as Germany has, for example, what we are seeing here is the emergence of quite a lot of regional and cantonal initiatives." Coupled with the instruments of the federal government, the country is well positioned and well equipped for change, he believes. Another aspect Ouerhani thinks could be of benefit to Switzerland is the fact that "transformations such as Industry 4.0 require new professions and skills to be taught. With our dual education system and training and development institutions, Switzerland already has a highly effective lifelong learning system." This can provide the knowledge needed to enable people to operate the new technologies and facilitate interaction between humans and machines.





“Collaborations in the field of innovation are always particularly valuable as they broaden mental horizons and force us to rethink our processes.”

Pierre-André Bühler, CEO, DYB,
member of the Swatch Group Management Board

Swatch Group is one of 25 industrial partners involved in the MiLL. Pierre-André Bühler is responsible for driving digitalization and Industry 4.0 forward at Swatch Group and is a partner to the MiLL. “The project covers all the aspects that interest us: Industry 4.0, digitalization, and sustainability.” The Swatch Group is also already involved in the Micro5 project. “These kinds of collaborations in the innovation space are always particularly valuable as they broaden mental horizons and force us to rethink our processes,” Bühler says adding that even if these projects are not necessarily financially viable, they would always be worthwhile because of the experience and skills gained. He finds the MiLL vision both fascinating and utopian at the same time: “The MiLL is a realistic concept in an evolution that we have not yet mastered. Whether the end result will ultimately look the way we envisage it today remains to be seen.” Nevertheless, plenty of technologies and methods would emerge in the process that could already be integrated into conventional manufacturing today. The Swatch Group wants to make use of these to drive microautomation forward, use the data gathered digitally in a meaningful way, and avoid manufacturing errors. According to Bühler, a micro-factory’s potential lies primarily in the growing demand for small production runs and custom manufacturing at competitive prices: “The MiLL would enable the time from development to market to be shortened, especially in the high-end segment of the watch industry, bringing you much closer to the customer.”



“A micromachine for Switzerland, the stronghold of micromachining.”

Philippe Chavanne, Director, LASEA Switzerland SA

LASEA is a manufacturer of high-precision laser micromachining systems headquartered in Belgium. “After we saw the Micro5, we said to ourselves – half-joking: ‘Wouldn’t it be wonderful to develop a MiniLASEA?’” says Philippe Chavanne, director of the subsidiary in Biel/Bienne. This wacky idea suddenly became very real when LASEA was asked to develop a microlaser for the MiLL. “LASEA had been supplying Switzerland for many years, so around four years ago we decided to set up a Swiss subsidiary to give us an even firmer foothold here. That’s why we were immediately gripped by the idea of co-developing a micromachine for Switzerland, the stronghold of micromachining.” And because space is at a premium in Switzerland, a small machine makes more sense, quite apart from the environmental aspect. But partners such as the engineers at the MiLL who have the microengineering skills are indispensable for developing a small machine, he points out: “So far, our experience is mainly in machines whose stability and precision are achieved by using granite or high-precision axes. Instead, we bring our expertise in optics to this project.”

A second reason for this collaboration is the Industry 4.0 aspect. “Many of our Swiss customers are already using our automated solutions, and we are also involved in developing smart machines, which will only benefit from this collaboration.” Although Chavanne doesn’t think smart machines will dominate every aspect of manufacturing in the future, he is nevertheless aware that large customers in particular will demand machines that can operate automatically and without human intervention. For Chavanne, an autonomous factory on a micro-scale is “a visionary and revolutionary project that can only come to fruition here in this region.”



TRANSIT

Components will be moved from one machine to another on independent shuttles that move horizontally and vertically.



INNER WORKINGS

Insights into the inner workings of the Micro5.