

Watchmaking and medical engineering Know-how Made in Besançon

Editorial

The TEMIS Technology Park and its ecosystem continue to astonish with the wealth of projects that are being developed in it every day. It comes as no surprise, then, that companies that are exceptionally dynamic are joining TEMIS. For example, we could look at Polycaptil and iXblue, which have recently decided to come to TEMIS. Their leading-edge know-how is recognised not just domestically, but also internationally.

Two areas with a high technology content particularly stand out, making Besançon and the wider region an exemplar of what needs to be done.

Watchmaking first, with companies that perpetuate high standards in watchmaking and microtechnology by inventing the time-pieces of the future. In that, they are supported by all the resources for training and research available in Besançon, particularly the researchers of the FEMTO-ST laboratory and its Time-Frequency department. This June, as in the past, the 24 Hours of Time event will celebrate and highlight our strengths in the field.

Medical engineering is another area where our companies and laboratories are leading the way. All the parties involved in TEMIS Santé, the University Hospital and its Centre for Clinical Investigation are doing sterling work for innovation in healthcare and the improvement of the care and comfort of patients. At its innovation day, the hospital put on display the latest technological advances achieved in Besançon in the fields of neurostimulation and assisted reproductive technology, to serve medicine in the future.

TEMIS and the whole ecosystem of our region are attractive. At the first edition of Journées Granvelle Besançon held this year, top experts and leading groups came together to work on the subject of digital technology, to exploit and make the most of the strengths of our region. Let us keep that momentum going!

Jean-Louis Fousseret,
Mayor of Besançon
President of Temis and Grand Besançon



P 2-3
24 Hours of Time
in Besançon



P 6-7
Biotherapy and technological
innovation

24 HOURS OF TIME IN BESANÇON TIME IN ALL ITS DIMENSIONS

An annual event that celebrates not just watchmaking know-how, but also research in the field of Time-Frequency, the fourth 24 Hours of Time will be held on 3 and 4 June.



Top to bottom:
organising team
of 24 Hours of Time:
Bernard Dulmet,
President of SFMC
Alexandre Tandin,
Director of France Bleu
Besançon
Delphine Dannecker,
Bill agency
Organiser of 24 hours
of Time

Ua promising event where 30,000 visitors are expected. The event was founded in 2014 at the initiative of Bertrand Lefebvre, former director of France Bleu Besançon, and is organised jointly by the French Society for Microtechnology and Timekeeping (SFMC), France Bleu Besançon and the Bill agency. "As early as in the second year of 24 Hours of Time, the need to bring in the world of research was felt. ENSMM and the FEMTO-ST Institute and its Time-Frequency department soon became participants at the event and SFMC became its sponsor." explains Professor Bernard Dulmet of the Time-Frequency Department of the FEMTO-ST Institute, also President of SFMC.

Microtechnology and watchmaking

While the event bears the mark of watchmaking in all its facets, it cannot be likened to a mere watchmaking fair. Because even though its exhibitors include watchmakers and a watch exchange is organised, this year over two days, the event also encompasses microtechnology as a whole.

"Microtechnology, and particularly micro-mechanical engineering, are areas of interest due to the contribution of the watchmaking heritage to microtechnology know-how in the region." clarifies Justine Martin, Project Manager at the Bill agency.

"The link between microtechnology and watchmaking may be obvious, but needs to be emphasised. The Applied Mechanical Engineering Department of the FEMTO-ST Institute regularly collaborates with watchmakers. The efforts of companies from the FEMTO-ST laboratory and the TEMIS Technology Park are revolutionising

the work of watchmakers and providing valuable assistance. Among the companies that could be mentioned in this context are Percipio Robotics (automation of watchmaking) and FrecInSys." adds Professor Bernard Dulmet.

Time is more than watchmaking

The 24 Hours of Time event is very aptly named. Because time is not just about watchmaking and microtechnology aspects. An exhibition at the regional contemporary arts centre will query the subjects of time and space, an atomic clock will be on display throughout the event and researchers will share their knowledge and passion for time in workshops open to the general public. "Watchmaking research is very focussed on industry, while time and frequency research covers other areas, such as astronomy. The work of the Time-Frequency Department of FEMTO-ST is not limited to mechanical clocks, those adapted to humans. For instance, we are also interested in optical clocks that are very precise, because they use high frequencies – and already develop atomic clocks – and can for instance be applied in financial markets to arbitrate transaction agreements." explains Professor Bernard Dulmet.





HIGH POINTS OF THE 2017 EDITION

- Round table meeting on **watchmaking in the early 21st century** on Saturday 3 June at 4 pm
- Talk on the **irruption of Ernest Lipmann in the watchmaking landscape of Besançon** on Saturday 3 June at 2.30 pm
- Free guided tour lasting one hour on **the symbols of time**, Saturday 3 June at 3 pm at the Time Museum
- **Watchmaking market hall** with over 20 brands present
- **Free games and workshops** for children and adults over the entire weekend
- **New: Watch exchange** throughout the weekend. Saturday 3 June (12 noon to 6 pm) and Sunday 4 June (10 am to 5 pm) at the Kursaal

Research and training, time to prepare the future

This year's event will highlight training. That is because it is indispensable to allow the public, particularly young people, to discover the different trades involved in order to prepare for the future. P2R Formations, the new watchmaking and polishing training centre in Besançon, the watchmaking high school in Morteau, the adult training organisation and many others will organise demonstrations and presentations of the courses on offer. The Muchrono organisation of ENSMM will coordinate a watch movement creation workshop and present its carousel - a revolving device designed to make watches more accurate. Experiments involving time and light will also be presented by the FEMTO-ST laboratory and its doctoral students.

24 Hours of Time

Date: 3 and 4 June 2017
Place: Besançon Granvelle
Admission free of charge

 24 Hours of Time

 #24HDT



More information
www.les24hdutemps.fr



Time-Frequency

With seven main departments and a multidisciplinary team of 750, the FEMTO-ST Institute is among the largest engineering science research laboratories in France.

One of its research units, the LNE-LTFB test laboratory, takes part in projects with a national and international scope for scientific developments in time and frequency.

World record holder for the measurement of time to 10⁻¹⁴ seconds, the department carries out research activities that have been recognised by the national strategy for research and innovation.

➔ KEY FIGURES

BESANÇON

French capital
of watchmaking

1,500

direct jobs in **luxury**
watchmaking
in Besançon

5,000

jobs in watchmaking
and luxury goods
in Besançon
= **6% of the overall
economy** of Grand
Besançon

2,200

jobs in watch-
making in
Franche-Comté

1,000

direct jobs in jewellery
and **luxury jewellery**
in Besançon

47

establishments
in Grand
Besançon

Source: Bill agency



SFMC

The French Society for Microtechnology and Timekeeping (SFMC) was founded in Besançon in 1931. As a scholarly society and voluntary organisation, it was recognised to be in the public interest in 1959.

The aim of SFMC is to promote all things related to the measurement of time. It also gives prizes and awards to young technicians, engineers, researchers and authors of works of high scientific value in the area of the metrology of time, frequencies and microtechnology. The organisation of conferences on the subject is also part of its duties.

A NEW GENERATION OF WATCHMAKING IS ON ITS WAY

The art of watchmaking in Besançon was at its zenith in the middle of the 19th century, collapsing eventually due to the many major national economic crises that occurred in the course of the 20th century. Forty years after the adventure of LIP, many are those who dream of a revival of 100% French know-how in the near future. Close up of some young companies that combine talent and promise.



Lornet, know-how à la française

The brand was born in November 2016 and stands out because of its ability to produce automatic mechanical watches that are developed, manufactured and assembled in France. Out of the 158 parts in its timepieces, only three come from Switzerland. The other components are made in Franche-Comté and the movement is made in house. Even though the brand is already exceptional because of its capacity to complete all its stages in France, the founder, Anthony Simao, would eventually like to achieve 100% French made status and create his own works.



More information
www.lornet-watches.com



Between traditional know-how and modernity

As the last French maker of mechanical clock movements, **Manufacture VUILLEMIN** is leveraging its know-how for modernity by offering contemporary creations that comply with the art of watchmaking and the requirements for living heritage company approval.

Now an indispensable player at events dedicated to the representation of the industry, the "Manuf" is looking at international markets by exporting its collections all over the world.



More information
www.manufacture-horloges-comtoises.com



The Observatory and accurate timekeeping

The science observatory of Besançon, which is the custodian of the viper's head hallmark, is one of the three bodies in the world certified for watch inspections.



More information
theta.obs-besancon.fr

Monumental clockmaking

Specialised in monumental clocks, **Utinam** is also a specialist of the reinvention of watchmaking in Franche-Comté, which is three centuries old! It uses new materials and gives them new forms, with a more contemporary and marked design.



More information
utinam.fr



REPARALUX

Repair workshop recognised for its know-how and expertise in the most prestigious makes of watches, **REPARALUX** was founded in 1956 by Marcel Humbert Droz. In June 2016, to celebrate its 60th anniversary, the company created its own brand of watches, Humbert-Droz. Its ambition is to make small quantities of French watches for a reasonable price. Three watch models were released, the first one named HD1 as a reference to the initials of the founder. With the exception of dials, the watches are made and assembled in the workshops of REPARALUX in Besançon, and can thus boast that they are "Made in Besançon".



More information
www.humbert-droz.fr

An alliance between high design and engineering

The new watchmaking brand from Besançon, **Phenomen**, is shaking up the industry through the bold design it has given its watches. Meyer and Gamiette are fine-tuning their own movement and ought to present their first model by the end of the year.



| Contact: alexandre.meyer@phenomen.fr

_programme

19–25 June/Paris

SIAE (Le Bourget)

The 52nd edition of the international aerospace fair will be held in the Le Bourget exhibition centre from **19 to 25 June 2017**. It will bring together all the players in global industry around the latest technological innovations.

Burgundy-Franche-Comté and the Aeromicrotech cluster of the Microtechnology centre will be at Hall 4- Booth F57.

For more information: www.siae.fr

20–23 June/Geneva

EPHJ EPMT SMT

EPHJ brings together trades and companies involved in watchmaking or jewellery. **EPMT** groups companies operating in microtechnology and nanotechnology. **SMT** assembles specialists of the medical engineering industry.

Burgundy-Franche-Comté will be represented collectively. Booth M41 (Regional booth of CCI Burgundy-Franche-Comté).

For more information: www.ephj.ch



POLYCAPTIL NOW IN TEMIS A FACILITY IN AN ECOSYSTEM THAT IS CONDUCTIVE TO DEVELOPMENT

Recognised for its know-how of the study and making of innovative solutions that combine the technology of electronics, optics and micro mechanical engineering, the company founded in 1991 in Besançon is now a subsidiary of the Delta group from Alsace, the leading manufacturer in the world of optical sensors for industrial processes. Since 2011, Polycaptil has a subsidiary: FCE, employing 18 staff and making printed circuit boards and assembly devices, particularly for the medical engineering industry. Under the management of Dan Nita, who has replaced Jean-François Vinchant, 14 engineers and technicians from its designing department work on mechatronics projects with high added value for a wide variety of fields.

From Calais lace to home automation and medical engineering: expertise to serve very specialised projects

Whatever the field of application, the same passion for technology drives the work of the company.

"30% of our business relates to Calais lace. Digitising Jacquard looms from the 19th century, which are not easy to programme, is exciting work," says Dan Nita. Thus, Polycaptil creates a matrix of electromechanical actuators that can simulate the pattern required for lacemaking. The component made in Besançon is then incorporated into the weaving machine.

Home automation (where technology is used to improve homes) is also an industry for which the company has developed solutions. Already well positioned in the making of meal trays for school canteens, Polycaptil is increasingly developing technologies for the household appliances of the future: smart systems for roller shutters, swimming pools etc.

Vedia System, an innovative medical device developed with the University Hospital of Besançon and Alcis

Vedia System is another major project on which the company is working. Devised with a team from the Centre for Clinical Investigation of the University Hospital of Besançon, Vedia System is a smart

diagnosis and manual ventilation assistance system designed for emergency workers treating cardiac respiratory arrest.

The device was developed in close collaboration with Polycaptil and Alcis, another company from Besançon, in order to address the needs of first aid workers in terms of ergonomics. The electromechanical system and the ad hoc software have been developed entirely by Polycaptil. After a test phase that has demonstrated improvement in manual ventilation (to over 95% of effective cycles compared to 7 to 10% without Vedia System), the product is now undergoing CE marking; Polycaptil will then take charge of making it before it is sold in the market.



New premises to accompany the projects of the future

From May, the company will enter its building covering some 1100m² in the TEMIS ecosystem.

The investment will be of use to support the technological developments of the company and accommodate new workers: a new mechatronics engineer is to be hired this year.

"Customers come to us with an increasing number of requests relating to the Internet of things, with the need to adapt products to Wi-Fi and Bluetooth® systems. Our services are more focussed on the making of smart printed circuit boards that can communicate data collected from the outside, transfer them to a database and then share them usefully after that, including on the web," points out Dan Nita. The new premises were thus necessary to accompany major investment planned to continually master spearheading technology. The technological and scientific environment of the TEMIS park will be decisive.

Contact: POLYCAPTIL
www.polycaptil.eu

CENTRE FOR CLINICAL INVESTIGATION OF BESANÇON (CICB) BIOTHERAPY AND TECHNOLOGICAL INNOVATION: DUAL COMPETENCY TO SERVE RESEARCH AND INDUSTRY FOR HEALTHCARE

Meeting with Dr Lionel Pazart, Joint coordinator of the technological innovation module of the CICB of the University Hospital of Besançon

Centres for clinical investigation (CICs) are clinical research organisations that serve investigators by allowing them to carry out their clinical and healthcare research projects

Founded in 1992 on the joint initiative of the National Institute for Healthcare and Medical Research (INSERM) and the General Directorate for Healthcare (DGOS), the CICs offer investigators (researchers, clinicians etc.) the resources that allow them to reinforce and promote the applications of the results of basic research to serve patients.

The projects may aim to understand a disease, where the idea is the result of work in research laboratories, or projects for testing new treatments.

The national network of CICs includes 54 centres differentiated on the basis of their specialities in technological innovation (CIC-IT), bioterapy (CIC-BT), epidemiology (CIC-EC), or plural themes (CIC P).

The Centre for Clinical Investigation of Besançon and local particularities

The CICB is the research organisation of the University Hospital of Besançon and has the particularity of being certified by INSERM and DGOS for research in **two areas of competency: Technological innovation and bioterapy.**

That comes as no surprise when you look at the region and its fabric of companies, recognised for their competencies in biomedical engineering and know-how of microtechnology and nanotechnology.

A pool of skills that results in technological innovation and engineering to serve healthcare, and naturally collaborates with the CICB to develop reliable projects that bring something new.

That means there is close and regular collaboration with many pure research laboratories in the region, such as the FEMTO-ST Institute and the companies in TEMIS and the Innov'Health cluster of the microtechnology centre (PMT) to support innovative projects that are liable to meet a healthcare need.

Translational research at the heart of the activities of the CICB

The main mission of the CICB consists in supervising research work and **promoting the transfer from pure research to patient applications**, which is part of **translational research**. All the stages of maturation of bioterapy or medical devices are verified by the CICB before the first human trials are initiated.

The work of the CICB is based on synergy between laboratories, the world of industry, academia and hospitals. That allows the organisation to offer a high-quality approach that encompasses the different stages of the project and thus be particularly proactive in the area of translational research.

"The process can also be of interest to other medical professionals, particularly in the area of telemedicine, which is precisely aimed at avoiding hospitalisation." adds Dr Lionel Pazart. The work methodology naturally depends on the different contexts of clinical studies.

For bioterapy (such as biological tissue grafts, blood transfusion or immune therapy), the steps are very similar and codified by a significant body of regulation. For technological innovation, the evaluation and test stages are variable and depend on the type of technology and its purpose (treatment, diagnosis, substitution, prevention etc.).

F-CRIN, E-CRIN, Tech4Health... a networked approach

For greater visibility of the action taken domestically and internationally, the

CICB is part of themed networks.

"The F-CRIN (**French Clinical Research Infrastructure Network**) coordinates all the research units on the national level. E-CRIN (**European Clinical Research Infrastructure Network**) relates to the European level.

The existence of these networks is all the more relevant for rare diseases, where, for example, the geographical extension they allow makes it possible to constitute patient panels that are larger and more representative. For more common disorders, the network can also be useful to make more rapid strides, particularly in the case of vaccinations, for example, where several centres can be recruited simultaneously with the same working methodologies" explains Dr Lionel Pazart.

The F-CRIN network has thus accredited several skills networks (in cardiology, sepsis, thrombosis, rare diseases, neurology etc.) for a prompt response to public health issues with the setting up of multi-centric studies conducted in several cities of France and in several European countries.

For medical devices, the **Tech4Health** national network operates as a platform of approved services, bringing together academic expertise in regulation and evaluation of healthcare technologies, to serve the development of medical devices, e-health and biomaterials throughout their maturation process. Tech4Health, a network accredited in 2014 by F-CRIN, is coordinated by Prof. Régis Beuscart (University Hospital of Lille), Prof. Frédéric Patat (University Hospital of Tours) and Dr Lionel Pazart of the University Hospital of Besançon. "Tech4Health primarily addresses clinical evaluation after translational research and the stages in the development of a new medical device. That network makes it possible to list the academic skills of each centre and call on them, individually or collectively depending on specific needs.

It coordinates high-level training courses and initiates methodological work to guarantee the quality of research." clarifies Dr Lionel Pazart.

Questions to Dr Lionel Pazart

How does a research project become a medical device that is mass-produced by a company?

In the best case, a project starts from a felt healthcare need, and the aim is then to set it against the clinical reality very early on. Then, laboratory developments make it possible to design prototypes that meet the requirements and specified needs, followed by a demonstrator. Their reliability and technical efficiency are thus validated. Manufacturing for clinical investigation can only be initiated after project maturation stages are verified and validated, and is followed by marketing. Concretely, there may be a range of cases. One or more researchers may decide to take their research project further and create a business take their product to the market. Researchers may turn to a company in the field, which has not just medical expertise, but also the resources required for production and marketing. We are also approached directly by companies that want us to carry out the clinical tests required for the CE marking of their product, and the demonstrative clinical trials required for the cost of treatment to be covered (e.g. by health insurance).

Could you name a few projects that have been developed by local start-ups with which you have collaborated?

The S-Alive project, designed for patients suffering from a lack of saliva or a dry mouth, which can happen after radiotherapy to treat cancer or due to the use of some mind-altering medication. The project, funded by the national agency for research (ANR) is the fruit of collaboration between the Maxillofacial Surgery department (Prof. Christophe Meyer and Dr Edouard Euvrard), the Centre for Clinical Investigation of the University Hospital of Besançon, the biology laboratory of the Pharmacy department, the veterinary school of Lyon and the company Cisteo Medical, founded during the project.

Cisteo is now a recognised company based in TEMIS and managed by its founder, Christophe Moureaux,



Dr Lionel Pazart

a mechanical and microtechnology engineer who has worked for several companies in the medical engineering field in the region.

Proviskin is a company specialised in innovative transcutaneous absorption solutions based in Besançon and co-founded by an engineer from the CICB on the basis of the work and patents developed there.

The other project in the news is **VEDIA SYSTEM**, an innovative device for manual ventilation

aimed at emergency workers treating cardiac respiratory arrest, which has been developed by a team from the University Hospital (Dr Abdo Khoury, Alban De Luca, Fatimata Sarr) and the CICB, in collaboration with two companies: Polycaptil and Alcis.

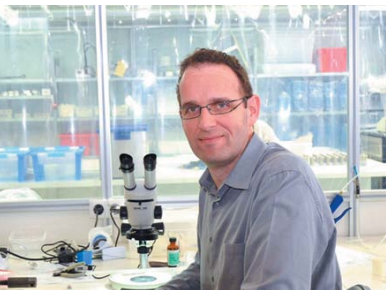
Do you take part in events that enable the emergence of innovative projects?

Yes, that has actually been the driver for the organisation in April of the Innovation Days of the University Hospital of Besançon (coordinated by Dr Bruno Wacogne for CICB and Fany Chedevergne for the microtechnology centre), with the themes of neurostimulation (Prof. Emmanuel Haffen), assisted reproductive technology (Prof. Christophe Roux) and clinical evaluation of medical devices (Thomas Lihoreau, Stéphanie François). The annual meeting, organised jointly by the University Hospital and the CIC, the FEMTO-ST Institute, the Microtechnology centre and its Innov'Health cluster, brings together academic researchers, hospital professionals and high-tech industry working for technological innovation. Tours of clinical departments, networking and the B2B meetings that close the event promote exchanges to analyse the clinical needs and envision the germination of new products.

**Contact: Centre for Clinical Investigation -
University Hospital of Besançon**
www.fc-sante.fr/cicbt-besancon



in brief



New clean room For Cisteo Medical

Specialised in the development and making of finished medical devices (implants, catheters, instrumentation, in-vitro diagnosis devices), Cisteo Medical works to customer specifications, under a contractual relationship. Its developments are thus made to measure, covering a number of fields of application: cardiac,

spinal, ENT, urology, obesity, plastic surgery etc.

In 2012, the company based in TEMIS started the development of class III implants for heart surgery, including design, manufacturing engineering and CE marking applications. In early 2017, Cisteo Medical grew by acquiring a third clean room of 63 m² with a five-axis laser welding machine with helium leak testing designed for welding implantable titanium devices. The new machine allows the company from Besançon to integrate and offer its customers a service that is as yet rare in Europe.

Contact: cmoureaux@cisteomedical.com

Cobotics to serve human intelligence

After **Chronogrip**, a collaborative robot that allows users to manipulate and observe miniature objects as if they were holding them in their own hand, **Percipio Robotics** has developed a new tool that revolutionises the concept of tweezers. They are intended for watchmakers; after three years of research, the **Teletweezer** device combines human intelligence with robotic capabilities to act, carry out a task and react depending on the environment. The motor integrated into the robotic tweezers applies force against the user's fingers. That force may be used to even out or limit the clamping effort by the user, or even

hold an object at a constant force with no human intervention. Among other uses, this new tool makes it possible to grasp an object with constant force, with a fixed opening, and maintain grasp on an object in vice mode. Objects can also be manipulated with a feeling of touch in a virtual (3D) environment for teaching manipulation to operators and training them.

Contact:
contact@percipio-robotics.com



— programme

28–29 June Grenoble - France

MedFIT

First international business conference dedicated to innovative partnerships in the field of medical technology, MEDFIT will be held from **28 to 29 June in Grenoble**.

TEMIS and the Innov'Health cluster will attend this major industry event along with e Biotika-ISIFC, Femto Engineering, Miravas, Proviskin, Créatemp, Stemcis, and Statice could secure new business streams, partners and experts depending on their needs.

For more information: contact@temis.org
www.medfit-event.com

5–6 July Dortmund - Germany

Health Business Connect

The **Innov'Health** cluster of Burgundy-Franche-Comté and its German partner, the IVAM cluster, will organise Health Business Connect on **5 and 6 July 2017 in Dortmund**.

On 5 July, there will be talks in English and/or German on the subject of microtechnology for healthcare. In the evening, a guided tour of the town and a networking dinner have been planned.

On 6 July, there will be pitches, business meetings and a number of other meetings to create partnership opportunities between participants hailing from different countries.

The 2016 event has 38 participants from France, Germany, Italy and other European countries.

For more information: contact@polemicrotechnique.fr
www.polemicrotechniques.fr/evenement/health-business-connect/

13–15 October Besançon - France

Hacking Health

The Microtechnology centre and Grand Besançon will organise Hacking Health of Besançon on **13, 14 and 15 October 2017** with two themes: "Digital technology and healthcare" and "Greater independence".

This healthcare innovation marathon is aimed at promoting the cross fertilisation of the skills of different parties who will work together to bring forth innovative projects.

In the run up to the event, two major events are planned:

- On 30 May, in TEMIS Innovation, from 6 pm to 8 pm, a *health hack meeting* on: "Is intellectual property dead?"
- On 14 June at ISIFC from 6 pm to 8 pm, on the subject of "Medical design"

Other events are being scheduled.

For more information: contact.besancon@hackinghealth.ca
or from mid-September on the website:
<http://hackinghealth.ca/bsancon>

Information: www.temis.org - +33 (0)3 81 50 46 95 - contact@temis.org