

| le savoir vivant |



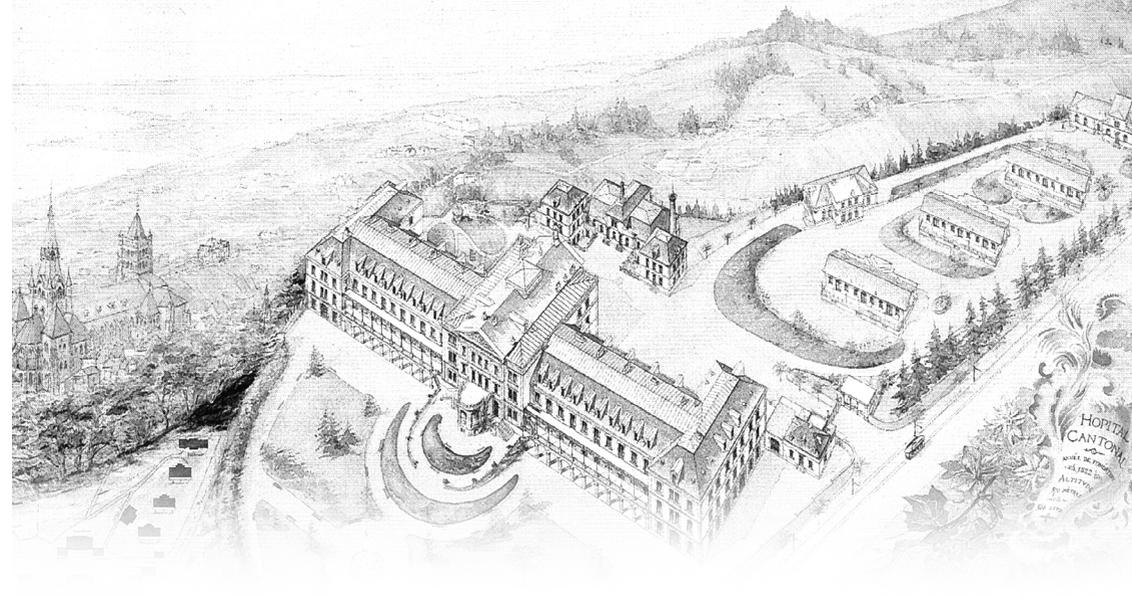
F B M

faculty of biology and medicine

Unil
UNIL | Université de Lausanne



Faculté de biologie et de médecine



history & organization

faculty of biology and medicine (FBM)

The shared history of biology and medicine at the University of Lausanne (UNIL) dates back to the 19th century, when the first chairs in medicine were created within the new Faculty of Science.

It made sense, then, to bring the two disciplines together in 2003 with the creation of the FBM. This setup, which is unique in both Switzerland and Europe, represents a major opportunity for our Faculty – it lets us cover all living organisms, from molecules, genomes and cells to organs, the human body, society and ecosystems.

By bringing the branches together, we've effectively bridged the gap between fundamental research and clinical practice to foster translational research, generating a continuous back and forth between the lab bench and a patient's bedside.

And thanks to that, the FBM stands at the forefront of training and research. Today we talk about personalized medicine that is based on genomics and proteomics. We are developing new antibiotic treatment strategies. We are uncovering potential sustainable solutions to ecological and health-related issues. The days of the lone practitioner are long gone. That doctor is now part of a network of specialists that includes biomedical engineers, together with advanced practice nurses trained by the FBM since 2007 at the University Institute of Training and Research in Patient Care (IUFRS).

Auguste Tissot
1728-1797

"Doctor of princes and prince of doctors". Defended inoculation. Researched onanism.



Mathias Mayor
1775-1847

Chief surgeon at Lausanne University Hospital. Improved numerous operating procedures.

César Roux
1857-1934

Helped found the Faculty. First person to successfully remove a pheochromocytoma.

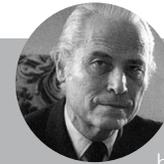


Charlotte Olivier
1864-1945

Key figure in the fight against tuberculosis. Focused on the social factors of the disease.

Jules Gonin
1870-1935

Developed the surgical treatment of retinal detachments.



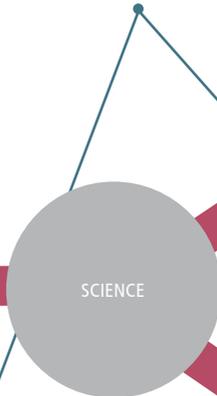
Claude Verdan
1909-2006

Specialist in hand surgery. Created a foundation to support the Musée de la Main.

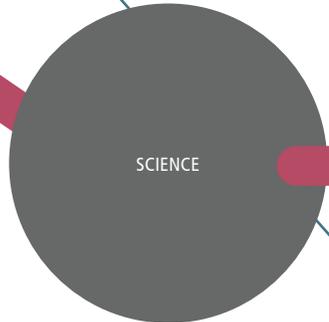
1837
faculty of arts and science is created



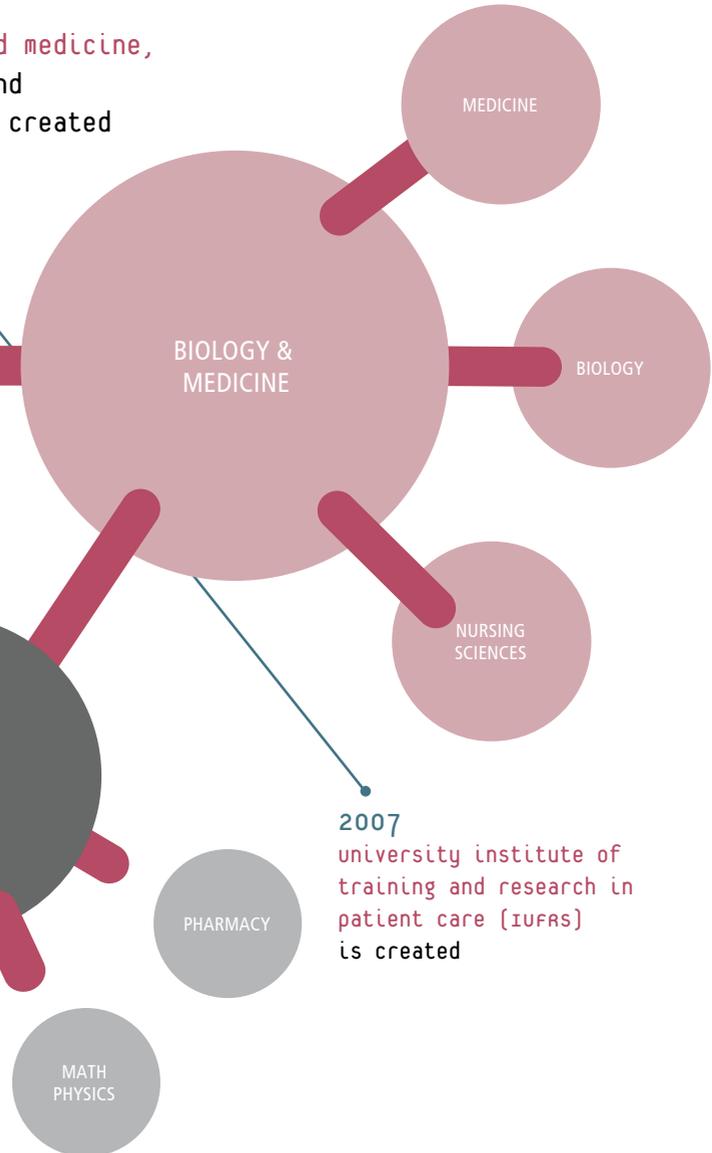
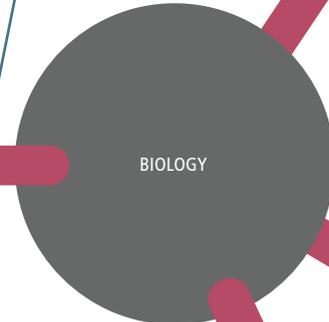
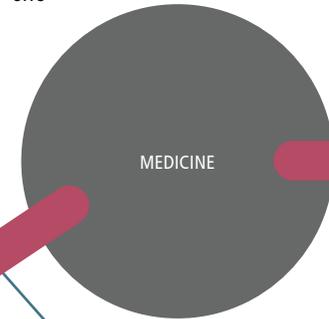
1890
medical sciences section of the faculty of science becomes the faculty of medicine



1869
faculty of science is created



2003
faculty of biology and medicine, school of medicine, and school of biology are created



2007
university institute of training and research in patient care (IUFAS) is created

2001
maths, physics and chemistry move to EPFL; pharmacy moves to the university of geneva

history & organization

Taking the path to become a doctor opens up a whole world of opportunities. Budding doctors might choose to pursue "the most beautiful job in the world" at the heart of the healthcare system and go into family medicine. Or they might specialize in an area such as surgery, oncology, cardiology, nephrology or psychiatry, or become a physician-researcher.

No matter which option you choose, the FBM's curricula provide all the necessary tools and skills. Our School of Medicine offers both Bachelor's and Master's degrees in medicine. In the three-year **Bachelor's programme** (180 ECTS credits) students study natural science (physics, chemistry etc.), biomedical sciences (biochemistry, morphology, physiology etc.), clinical medicine, human sciences in medicine and public health.

Then in the three-year **Master's programme** (180 ECTS credits) students learn the theoretical bases of different diseases and gain clinical experience taking care of patients. The entire sixth year, for example, is spent doing internships.

Students must have a Master's degree in medicine to be eligible to take the Swiss federal examination in medicine, governed by the Medical Professions Act.

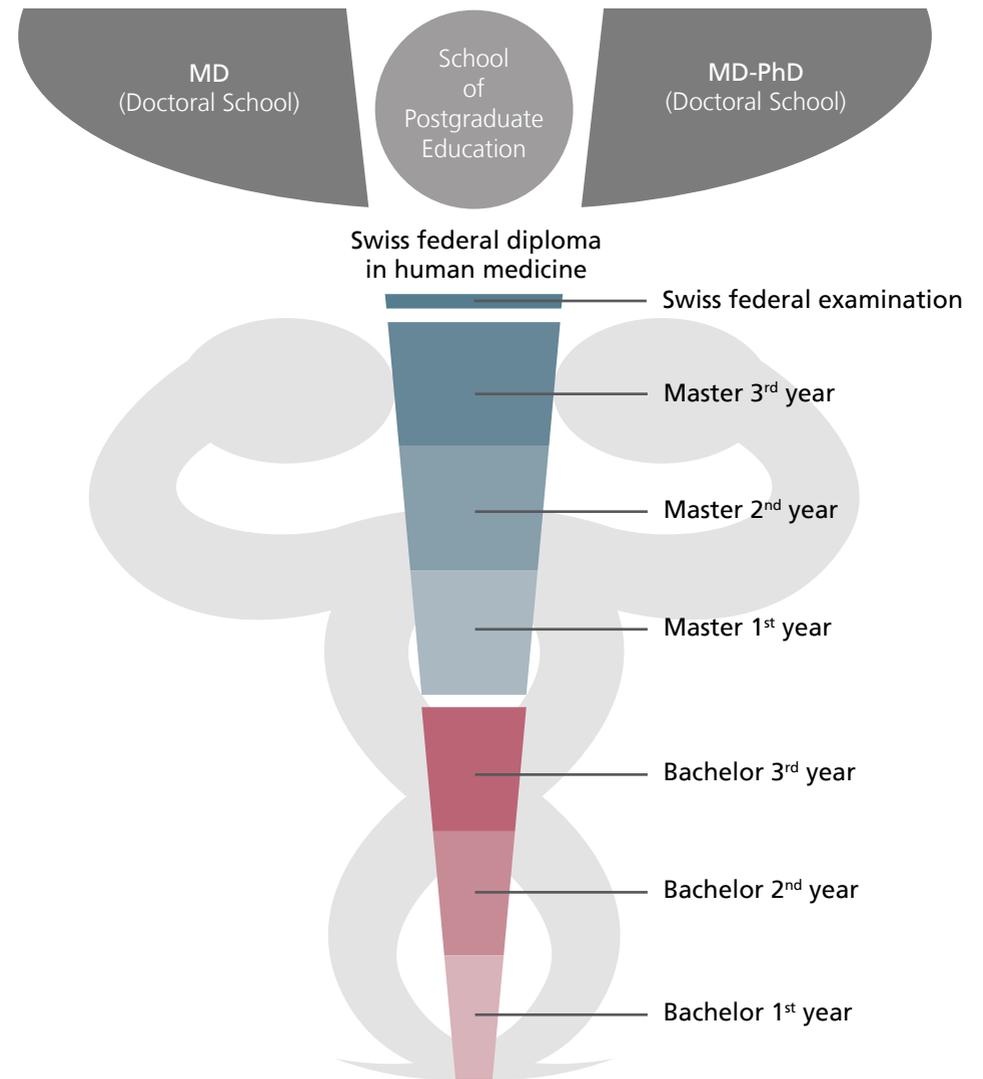
Through the UNIL-CHUV School of Postgraduate Education, the FBM also has a postgraduate programme that offers the Swiss Institute of Medical Education's¹ medical specializations for the Canton of Vaud. And as part of the Doctoral School, students can pursue a **Doctorate in Medicine (MD)** or a **Doctorate in Medicine and Life Sciences (MD-PhD)** if they are more research-focused.

Given the current shortage of doctors, students interested in embracing a career in medicine have numerous job opportunities waiting for them. And the FBM can help them get there. In 2017, our staff of nearly **450 professors** taught some **1,900 students**, including **375 MD** and **MD-PhD students**. Our undergraduate students can gain clinical experience in around 25 of the CHUV's services, around 15 regional hospitals and with approximately 200 established practitioners.

School of Medicine unil.ch/ecoledemedecine

Doctoral School unil.ch/ecoledoctoralefbm

School of Postgraduate Education chuv.ch/cole-formation-postgraduee



¹The Swiss Institute of Medical Education is an autonomous body of the Swiss Medical Association

Students who pursue our School of Biology's 4.5-year Bachelor and Master of Science in Biology gain a comprehensive knowledge of biological sciences, starting with the molecules that form cells and expanding to organisms in their ecosystems.

The three-year **Bachelor's programme** (180 ECTS credits) provides students with a solid base in biology. They then further specialize by following one of our three Master programmes (90 ECTS credits), which last three semesters.

- **Master of Science (MSc) in Behaviour, Evolution and Conservation**

The MSc in Behaviour, Evolution and Conservation combines an in-depth approach to ecology and evolution with the opportunity to work on wildlife and local flora. Students will investigate intra- and interspecific relationships, as well as how organisms evolve and adapt to changing biotic and abiotic factors. At the interface between economics and biology, the Behaviour, Economics and Evolution (BEE) specialization looks at social interactions, applying concepts from both evolutionary biology and economic theory.

unil.ch/eb-bec

- **Master of Science (MSc) in Molecular Life Sciences**

The goal of the MSc in Molecular Life Sciences is to train students to explore life through experimental and computational approaches. The programme's in-depth curriculum delves into molecular genetics, genomics, cell biology and developmental biology. Students also gain hands-on experience, learning techniques such as sequencing and annotating genomes.

unil.ch/eb-mls

- **Master of Science (MSc) in Medical Biology**

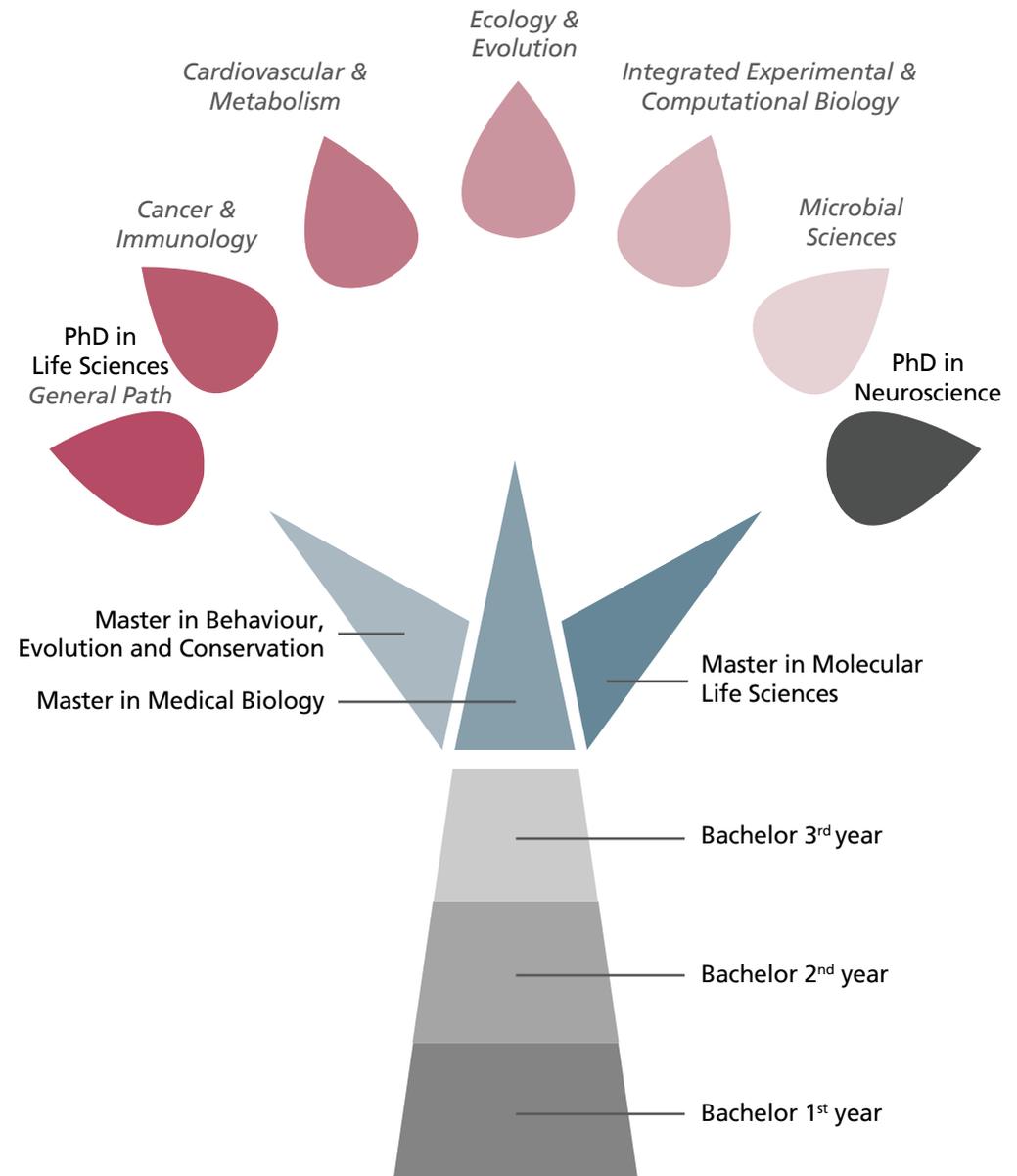
The MSc in Medical Biology is for students interested in biological research in the medical field. More specifically, it focuses on the areas of expertise needed to develop preclinical and clinical applications. Students learn about basic cellular functions, such as signal transduction, as well as the normal and pathological functioning of the most important systems of the human organism. The programme offers four fields of specialization: immunology & cancer, metabolism, neuroscience, and pharmacology & toxicology.

unil.ch/eb-mb

The first year of the Geneva-based Bachelor in Pharmacy is also taught at the School.

And, our Doctoral School has two PhD programmes: a **PhD in Life Sciences**, with several specializations, and a **PhD in Neuroscience**.

School of Biology unil.ch/ecoledbiologie
 Doctoral School unil.ch/ecoledoctoralefbm



nursing sciences

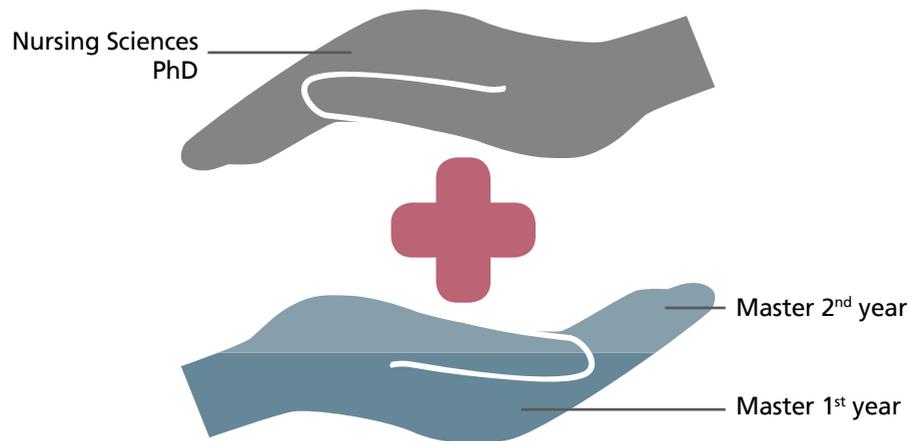
university institute of training and research
in patient care (IUFRS)

UNIL and the University of Applied Sciences and Arts for Western Switzerland (HES-SO) offer a joint **Master of Science in Nursing Sciences**, organized by the IUFRS. This four-semester programme (90 ECTS credits) aims to improve the quality of treatment that clinicians provide and optimize students' research methodology.

The IUFRS also offers a PhD in Nursing Sciences, in collaboration with our Doctoral School.

In January 2016, over **60 students** were enrolled in the Master's programme, with around **a dozen students in the PhD programme**.

IUFRS unil.ch/sciences-infirmieres



teaching unit

The Teaching unit is responsible for evaluating the FBM's courses in medicine and providing pedagogical support to our professors through classes, workshops and individual coaching.

Unit staff actively monitor and research the latest teaching techniques in medical education, including evaluation methods and innovative technologies like e-learning.

Teaching unit unil.ch/fbm-up



it's never too early to consider a career in academia!

It's not every day you hear someone say they want to become an academic. Many assume it's next to impossible, whilst others think it's simply too old fashioned. And yet, if you're passionate about a particular subject, it can be one of the most fulfilling careers both professionally and personally.

And it's never too early to start thinking about it.

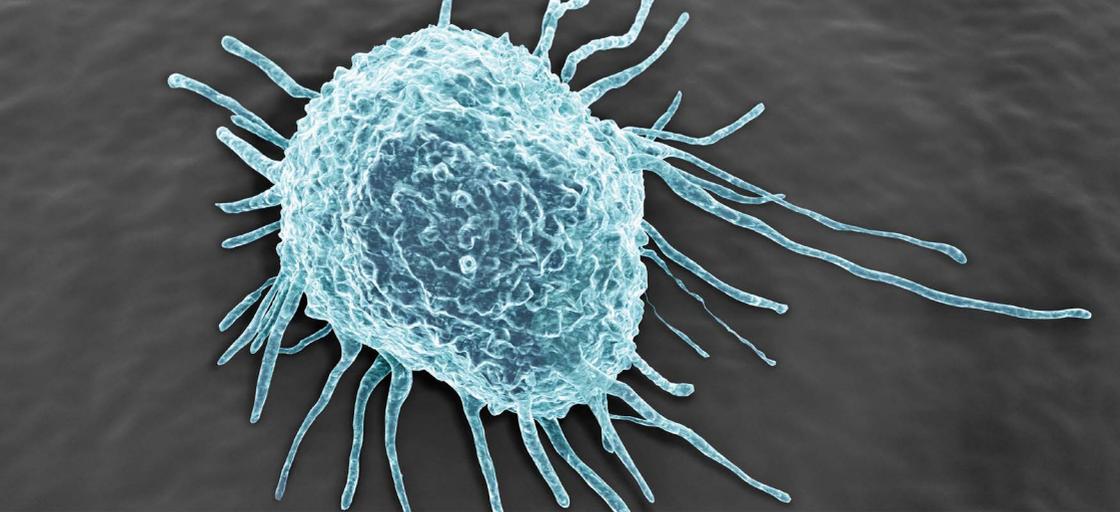
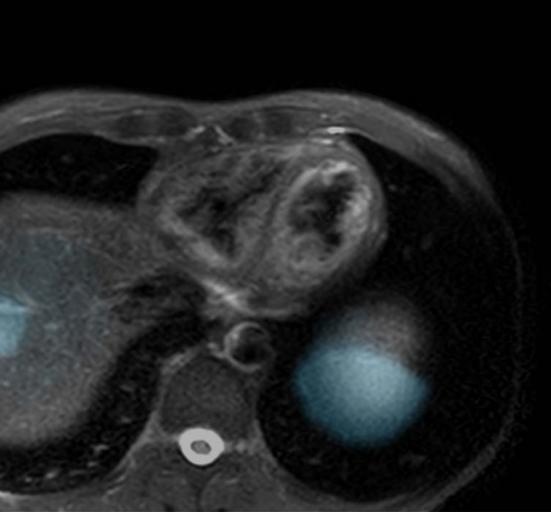
It starts with a spark, an interest in innovation and excelling in a specific area. Then you conduct your research, navigating the intense twists and turns of hypotheses, experiments, exchanges with other researchers, and a constant flux of knowledge. In the end, you are rewarded with a career full of personal and intellectual achievements in a field that, above all, you find fascinating.

The core missions of the Faculty of Biology and Medicine are to teach, research and ensure there is always a new generation of academics to come. And as an ambassador of the academic world, we understand that passing on knowledge to others, keeping the public well informed, stimulating discussions and promoting dialogue are all integral parts of our role in society.

The engaging path of an academic is filled with milestones – degrees, certificates, grades and awards that attest to your personal and intellectual development. To find out more, read our Guide to a Career in Academia (in French).

Academic careers unil.ch/fbm/releve

Guide to a Career in Academia unil.ch/fbm/guide-releve



innovative technologies

Our Faculty is fully invested in using cutting-edge technology, from **robotics** and **cell dissection technology** to **telemedicine** and **advanced imaging**.

With **molecular imaging** sensitivity and resolution improving in leaps and bounds, we can now observe how organs function in vivo down to the last picomole. In precision medicine – especially oncology – doctors are using this powerful diagnostic tool to better hone a therapy and, after analysing the body's response to the treatment, rapidly adapt their strategy. Furthermore, imaging and therapy treatment are a core principle of **thernostics**, which combines "therapy" and "diagnostics".

Cellular imaging uses technologies like fluorescence and multiphoton microscopy to achieve sub-cellular spatial resolution and to project, for example, a cell's mitochondria or a neuron's dendritic spines. This, in turn, lets us fully observe the functions of cells even within living organisms.

clinical research

One of our Faculty's key objectives is to conduct high-quality, original clinical research. Two such studies are the CoLaus|PsyCoLaus and the Swiss Transplant Cohort Study (STCS).

CoLaus|PsyCoLaus, which we began in 2003, is a long-term investigation of risk factors and genetic variants associated with cardiovascular disease and psychiatric disorders. The **population-based study** of over 6,700 participants, representing a sample of Lausanne, has already evolved into several sub-studies: HypnoLaus (**sleep**), OphtalmoLaus (**vision**), GeocoLaus (**environment**) and SonoLaus (**noise pollution**). Over 300 publications have been produced as a result.

As opposed to studying a general population cohort, the STCS is a multi-centre cohort of patients from the five Swiss university hospitals, as well as St. Gallen cantonal hospital. Launched in 2008, the study follows every patient who received an organ transplant in Switzerland, collecting quality laboratory data and blood samples – a gold mine for clinical and translational research on organ transplantation.

humans and the environment

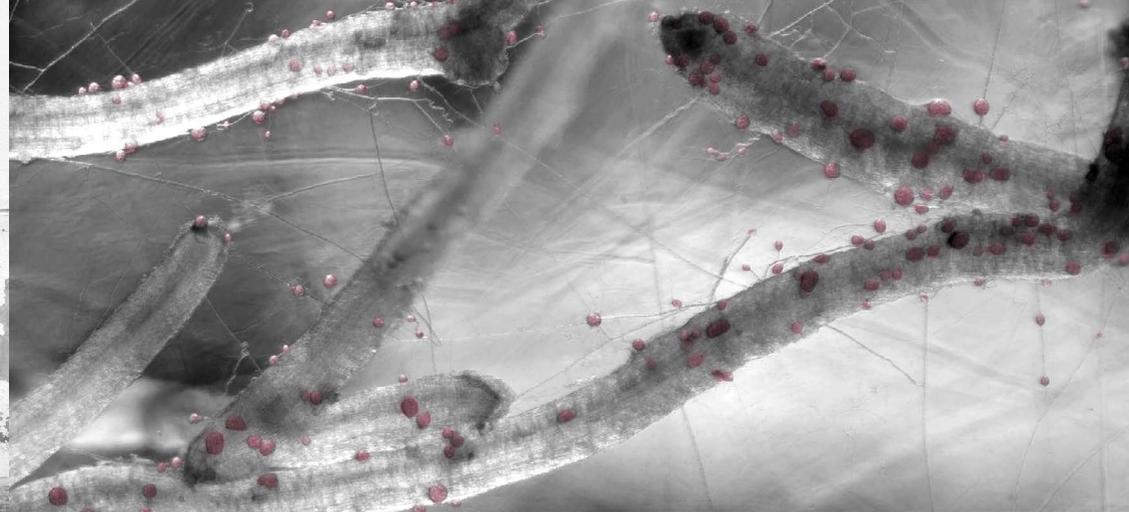
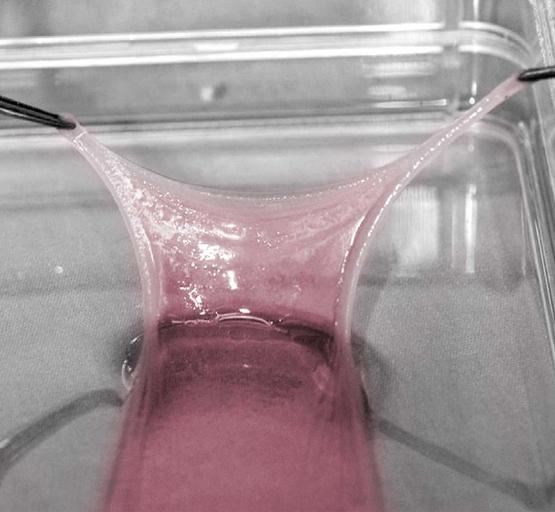
At the FBM, we believe an interdisciplinary approach is key to researching **infectious diseases**, **immunity** and **cancer**. Teams of researchers with an array of backgrounds were assembled to work on **HIV**, and we have already been able to apply the lessons learnt from this infectious disease to a number of areas – specifically **immunology**. This, in turn, drove further research on vaccines. Thanks to this dynamic, Lausanne is internationally recognized as a leader in vaccine research. The CHUV, for example, is the only European centre to be part of the US-based HIV Vaccine Trials Network.

The **vaccinology** know-how and tools developed in Lausanne have also helped scientists set up protocols for other diseases, including malaria, tuberculosis, ebola, hepatitis C and yellow fever.

At the **Swiss Cancer Center in Lausanne**, researchers have been concentrating their efforts on **immunotherapy**, in which doctors treat a tumour using the patient's own immune system. Since cancer cells escape the body's immune system by tricking it and inhibiting its defence mechanisms, the challenge is in understanding the molecules and cells at work in the tumour's microenvironment, as well as the tumour's interactions with the immune system.

So far, researchers have developed three promising therapies: immunomodulators, which "reactivate" the immune system's defence mechanisms; therapeutic vaccines; and **cell therapy**, which entails taking a patient's T cells, altering them so that they recognize the tumour and injecting them back into the body. Immunomodulatory monoclonal antibodies were recently approved to treat a growing number of tumours.

These therapies, in addition to chemotherapy and radiotherapy, take account of the specific characteristics of each cancer and each patient.



understanding structure & function

To effectively treat patients, you need to understand the structural, molecular and genetic mechanisms at work in living organisms. So FBM researchers are going straight to the source of it all and studying **stem cells** in plants, animals and humans.

Great strides have been made in stem cell research since their discovery soon after the end of the Second World War. In the 1980s, the **first autologous skin grafts** were grown from adult skin stem cells in a laboratory. At the end of the 1990s, scientists successfully isolated human embryonic stem cells. And in 2006, **induced pluripotent stem (IPS) cells** were produced from "reprogrammed" adult cells.

These breakthroughs paved the way for disease modelling and regenerative medicine. Researchers have already begun clinical trials for **age-related macular degeneration (AMD)** and are currently studying potential applications for diabetes, myocardial infarctions and neurodegenerative diseases.

our role in society

The FBM has actively embraced its role in **shaping the future of healthcare** – medicine, after all, is a human science.

Through the IUFERS, we are already changing **advanced nursing practices**, moulding it to the needs of the ageing population and rise in chronic illnesses. In certain cases, specialized nurse practitioners are being called upon to work with or stand in for doctors on the frontline, making personalized care part and parcel of personalized medicine.

The FBM is also looking to the future for both healthcare providers and their patients – specifically in vulnerable populations. In 2016, Switzerland created the first chair in medicine for **vulnerable populations**. The concept, which initially focused on migrant patients, now encompasses any person whose socio-cultural background results in them receiving unequal healthcare. Currently in Switzerland, 13% of the population does not have access to healthcare services, and 800,000 people are illiterate, half of whom are natives.

ecology & evolution

It is important for us to have a comprehensive understanding of all aspects of biological systems, from **organization** and **evolution** to **adaptation** and **intra- and interspecific communication**. What makes our goal all the more challenging is the sheer reach of the field, which encompasses the animal kingdom, plant kingdom, microbes and ecosystems as a whole.

Let's take **ants** as an example. To what do they owe their success as a species? After all, they represent 10% of the Earth's animal biomass, on a par with human beings. In the end, it is their social organization, cooperation and efficient division of the workload that have allowed them to change their environment. In this way ants are an excellent model for us to understand the evolution of sociability. But we can also use them to study the **genetics of ageing**. Why can a queen live 30 years, which is significantly longer than a worker ant, even though they share the same genome? And what about their behaviour? What are the groups of genes – or "**super genes**" – that influence the insect's social organization? FBM researchers are looking into these questions and many more.

And in the plant kingdom, **mycorrhizal fungi** have proven to be a fascinating subject of study. These microscopic organisms form on plant roots and extend their filaments well beyond the root system. In so doing, they help the plants draw in previously inaccessible nutrients, especially phosphates. This symbiosis has offered a promising lead in **sustainable development** – couldn't we use these fungi alongside fertilizers to boost food production?

Well, researchers tried it. Through natural selection, they developed new strains of mycorrhizal fungi and tested them under field conditions on cassava crops in South America and Africa. Result: they successfully doubled cassava yield.

These are just two examples of how the FBM draws on pure scientific research to solve real-life problems.

key strengths



History

We benefit from a long tradition of innovation dating back to the 19th century.



A unique setup in Switzerland and Europe

You won't find biology and medicine under the same roof anywhere else. By bringing the two branches together, we've facilitated the interdisciplinary collaborations that are key to the bench-to-bedside approach of translational research.



Hospital network

The FBM works hand in hand with the Lausanne University Hospital (CHUV) – one of the largest hospitals in French-speaking Switzerland – and the Jules Gonin Eye Hospital, a European centre of excellence in ophthalmology.



Oncology & immunology

We remain at the forefront in immunology and oncology research, thanks to the Swiss Cancer Center, which comprises UNIL, CHUV, the Swiss Federal Institute of Technology in Lausanne and the Swiss Institute for Experimental Cancer Research.



Medicine

Our programme prepares students for the Swiss federal examination in medicine and offers them the opportunity to work on research and engineering.



University Institute of Training and Research in Patient Care (IUFRS)

The IUFRS promotes advanced nursing practices by incorporating research and patient care into a Master's and a PhD programme.



Biology

Our specialized Master's programmes range from biomedical studies to ecology & evolution to molecular biology.



Neuroscience

We place a strong emphasis on neuroscience fundamentals and clinical research through a number of projects, including the Cantonal Centre for Autism.



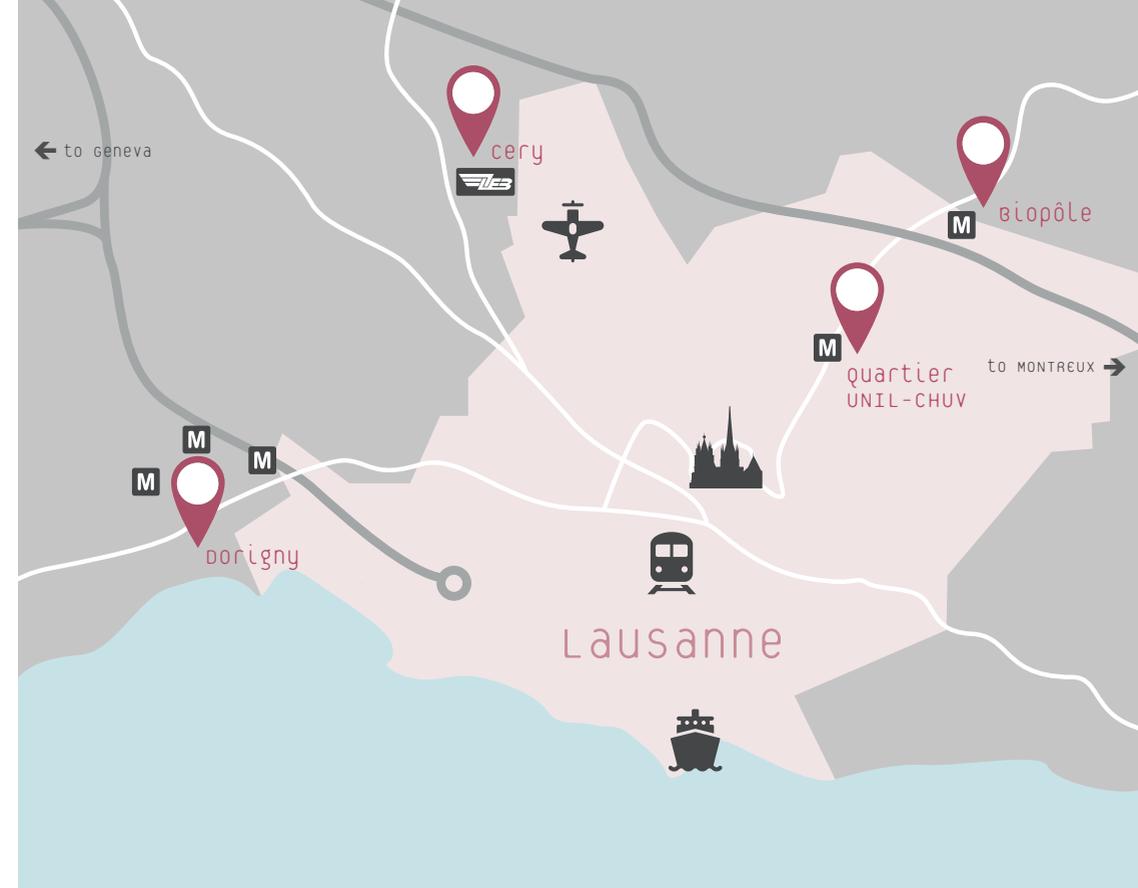
Research

FBM research projects span an array of fields and disciplines, including clinical research, plant molecular biology and studies on animal behaviour.



Technology

The FBM uses cutting-edge technology in imaging, genomics and proteomics.



campus

4 sites

The FBM is present at four sites that are connected by the M1 and M2 metro lines and the LEB railway :

- Dorigny campus, between UNIL and EPFL
- CHUV medical campus, next to the hospital
- Epalinges campus, shared with the Biopôle technology park
- Cery, for our Center for Psychiatric Neurosciences

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