# WELCOME



### PROF. BENOÎT DUBUIS I DIRECTOR OF CAMPUS BIOTECH

Geneva has long been a special place where people and countries come together in a spirit of hope to work for change. Home of the United Nations, this spirit of collaboration, this desire to unlock potential, is part of the city's very fabric and is why Campus Biotech could have no other home in which to realise its vision for groundbreaking medical and neuroscientific research. Thousands of specialists from around the world have come together in this spectacular setting to use science and experimentation to transform hope into reality. Individually, we develop applications that improve quality of life; as one, we push the boundaries of neuroscience, digital and global health to save lives worldwide.

Campus Biotech's multidisciplinary approach is vital in expanding our knowledge in the field of life sciences. We understand that even the biggest ideas have small beginnings, so creating an incubating environment is at the heart of our mission. When we bring start-up energy, R&D facilities and industrial partners together, we ensure projects have access to the resources and skills that they need to push the frontiers of medical discovery, to make breakthroughs and to write history.

I warmly invite you to discover the richness of the Campus Biotech ecosystem, which is built around three values: innovation, collaboration, and translation. With innovation, we find new ways of doing things for the benefit of patient and population. With collaboration, we don't duplicate efforts, but capitalise on existing knowledge, promote synergies and secure impact. And with translation, we bring academia, entrepreneurship and industry together to create products and solutions that can save and improve lives.

Welcome to our Campus



"In life there is no solution, there are running forces. Let us create these forces and solutions will follow."

> campus biotech

ANTOINE DE SAINT-EXUPÉRY

"This project presents an extraordinary opportunity for collaboration between EPFL and UNIGE in the field of applied biomedical research."

JEAN-DOMINIQUE VASSALI RECTOR OF THE UNIVERSITY OF GENEVA 2007-2015

"The Wyss Center is growing into a multidisciplinary organisation whose mission is to develop neurotechnology for human benefit that will solve critical medical problems and translate these transformative technologies into products that will impact society and the world."

HANSJÖRG WYSS ENTREPRENEUR AND PHILANTHROPIST

"Campus Biotech represents a unique opportunity to develop R&D capabilities in the biotechnology sector around Lake Geneva and to promote a variety of jobs intrinsically linked to this field."

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PATRICK AEBISCHER PRESIDENT OF EPFL 2000-2016



**COMMITTED FOUNDERS** (LEFT TO RIGHT)

JEAN-DOMINIQUE VASSALI | Rector of the University of Geneva 2007-2015, HANSJÖRG WYSS | Entrepreneur and philanthropist, PATRICK AEBISCHER | President of EPFL 2000-2016, ERNESTO BERTARELLI | Entrepreneur and philanthropist.



## The strength of the network contributing to the Campus Biotech impact



# A UNIQUE ECOSYSTEM

# Coming together to change the face of modern medicine

While science has been pushing the boundaries of human knowledge for millennia, crossing boundaries between disciplines and sectors is something relatively new. Campus Biotech was created and purpose built to do just that. Its four founding partners – the Bertarelli Family, Hansjörg Wyss, the University of Geneva and the EPFL – share a commitment to working across, rather than between lines. They joined together, determined to help the Lake Geneva region maximise its huge potential in the realm of life sciences. In our breath-taking 40,000m<sup>2</sup> facility that houses and gives life to their vision, we have built a unique ecosystem that brings scientific platforms, academic, clinical, industrial and entrepreneurial actors together. Here we have a space to share knowledge and to forge new pathways in neuroscience, digital and global health.

This ecosystem between previously separate universes is changing the face of modern medicine. Many academic and industrial partners have come together at Campus Biotech to put science at the service of public health. We have drawn teams from the University of Geneva (UNIGE), the Swiss Federal Institute of Technology (EPFL), the University Hospitals of Geneva (HUG), the Human Brain Project (HBP), the Swiss Institute of Bioinformatics (SIB) and the Geneva School of Engineering, Architecture and Landscape (HEPIA). Together we are spearheading a transition from academic research into industry-driven development.

Like any good ecosystem, we have created an environment designed to kindle interaction. While parts of our building are reserved for the industrial world, start-ups are given their own dedicated space to grow. In 2016 we inaugurated the Campus Biotech Innovation Park, dedicating 4,500m<sup>2</sup> to start-ups. We also work closely with nearby universities, R&D centers, hospitals and incubators to drive new discoveries forward. Furthermore, in 2017 we were proud to announce a new Catalyst Fund. Made possible by the Bertarelli Foundation, this supports projects that are conducted jointly between our research entities and is run by a scientific committee led by Patrick Aebischer, neuroscience researcher and former EPFL president.

The Wyss Center for Bio and Neuroengineering is another essential part of the Campus Biotech ecosystem, playing the role of translational organisation, accelerating the development of neurotechnology from research labs to clinics. Campus Biotech is proud to also house Switzerland's first Genome Center providing high-throughput DNA Sequencing and Data Analytics and Interpretation Platforms for research and genomic medicine. The long-term goal is to advance knowledge of disease pathogenesis, improving human health through preventive, diagnostic and therapeutic approaches, thereby realizing the social and economic benefits of genomics..

We know that nurturing our ecosystem in Geneva has the potential to advance medical breakthroughs worldwide, bringing the best healthcare to the wider world. It is in that spirit that we welcome you and invite you to help enrich our ecosystem and contribute to our mission.

## Heating and cooling Campus Biotech using water from Lake Geneva

Ever since it was first planned in 2000, the building that is now home to Campus Biotech integrated environmental principles into its architectural design. For over ten years, **the 40,000m<sup>2</sup> building has been heated in winter and cooled in summer by using water from Lake Geneva.** This fully local energy source is **100% renewable**.

The Campus building is a pioneer in Geneva, as it opted to use **'GeniLac'** energy, a groundbreaking and sustainable innovation developed by local energy provider, **SIG, the Services Industriels de Genève**. Using water from the lake significantly reduces the environmental impact of this unique global research center.

Water from the lake is the main energy source for the building: to date, **100% of the energy required for generating cold is renewable**, and Lake Geneva water provides up to 75% of the energy to heat the Campus.



# Providing the tools to support cutting edge research

At Campus Biotech we excel in three domains: Neuroscience and Neurotechnology, Digital Health and Global Health. We diversify our skills pool by supporting open research with different institutions. Our state-of-the-art platforms, the enabling tools of modern science, are available to our researchers and partners whether they are based on-site or off-site. The advancement of life here gives way to a better quality of life across the globe.

# NEUROSCIENCE & ENGINEERING PLATFORMS

### **1** Human Neuroscience Platform

Our Human Neuroscience Platform (HNP) provides an integration framework for the neuroscience research community. This platform enables a diverse community to improve their understanding of how the normal brain works and how the pathological brain dysregulates. It regroups several facilities: the Magnetic Resonance Imaging (MRI), the Electroencephalography – Brain Computer Interface (EEC – BCI), the Psychophysiology, the Virtual Reality (VR), The Clinical and Sleep Research Unit (CSRU), the Neuromodulation, the Robotics Haptic Cognetics and the Methods & Data facilities. **Contact: humanneuroscience@fcbg.ch** 

### 2 | Preclinical Neuroscience Platform

Our Preclinical Neuroscience Platform (PNP) provides facilities, logistics and high-level support for neuroscience and neuroengineering research. The platform enables scientists to test neurotechnology devices and perform behavioral and neuroscientific studies. The PNP also includes a state-of-the-art imaging facility and provides a full-service imaging platform from whole organ sample clarification to lightsheet imaging then 3D VR visualization of cellular resolution images (ALICe). **Contact: pnp@wysscenter.ch** 



Providing the tools to support cutting edge research

# NEUROSCIENCE & ENGINEERING PLATFORMS

### **3** Neural Microsystem Platform

Our Neural Microsystem Platform (NMP) offers four facilities, including a 200m<sup>2</sup> cleanroom and equipment dedicated to the creation of experimental systems using microtechnologies, a laser micromachining equipment, a packaging and ageing area and a Nanolab for nanoparticles manipulation. Comprising three areas, the cleanroom includes a PDMS area dedicated to manufacturing stretchable films (ISO 7) and a Dry Process and Lithography area (ISO 7 and 5) for normal micro-fabrication processes. **Contact: neuralmicrosystems@fcbg.ch** 

### **4** | System Integration Platform

Our System Integration Platform (SIP) brings together individual components to create and assess complex neurotechnology systems. Here we have electronic and mechanical workshops (open access workshops and design and manufacturing service) that can manufacture advanced device prototypes. Our highly specialized manufacturing consultants are ready to help, alongside neurotechnological software engineering experts and technical support. **Contact:** systemintegration@fcbg.ch

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Providing the tools to support cutting edge research

# GENOMIC PLATFORMS

### 5 | Health 2030 Genome Center

The Health 2030 Genome Center is a multi-institutional hub established to promote genomic medicine in Switzerland. With its two platforms, the Genome Center is the genomic medicine arm of the Health 2030 initiative (Health2030.ch).

• DNA Sequencing Platform: supports large-scale genetics and genomics research, as well as clinical-grade diagnostic nucleic acid sequencing. This platform performs data generation for whole genome sequencing (WGS), whole exome sequencing (WES), full transcriptome sequencing (RNA-seq) and other genomic analyses.

• Data Analytics and Interpretation Platform: provides current and state-of-the-art data analytics pertaining to all levels of genome analysis in both clinical and research environments. **Contact: genome.center@fcbg.ch** 

### 6 | The Gene Therapy Platform

The Bertarelli Foundation and EPFL have renewed their longstanding partnership to create a gene therapy platform here at Campus Biotech. Funds are split between developing the platform and creating a "catalyst fund" to promote further interactions between projects run jointly by the various research teams. This platform is set to drive forward the fields of research that will revolutionize tomorrow's medicine. **Contact: genetherapy@fcbg.ch** 

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# "Accelerating neurotechnology for human benefit."

The Wyss Center is an independent, non-profit, neurotechnology research and development organization with ongoing projects in brain computer interfaces for movement restoration, stroke rehabilitation, brain circuits, sensory function, and advanced technology.

The Center provides the expertise, facilities and financial resources to translate creative neuroscience research into clinical solutions that will improve the lives of people with nervous system disorders.

The Wyss Center works closely with Campus Biotech to run major research platforms that support the entire pipeline of neurotechnology development, from prototype device fabrication and testing through to human pilot trials.

The Center's experienced multi-disciplinary neurotechnology development team brings experience from industry and academia to provide the integrated scientific, engineering, clinical, regulatory and business expertise required to guide high-risk, high-reward projects on their journey from research to product.

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## The Health 2030 Genome Center

### PROF. EMMANOUIL DERMITZAKIS

### Large Scale Genome Analysis in Support of Personalised Healthcare and Biomedical Research

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The Health 2030 Genome Center is a multi-institutional hub established to promote genomic medicine in Switzerland. The Genome Center is the genomic medicine arm of the Health 2030 initiative (Health2030.ch), whose goal is to promote Swiss personalized medicine (initiated by: EPFL, UNIGE, CHUV, HUG, UNIL, InselSpital and UNIBE).

The Genome Center is more than simply a large-scale sequencing facility: it aims to integrate and synergize with several groups working on human genetics and genomics in Switzerland.

The Genome Center was conceived as a hub for genetics and genomics research to foster collaboration, to increase communication and to promote the sharing of ideas, allowing for the long-term development of major initiatives. In addition, the Genome Center increases the impact of the sequencing facility itself as new developments and projects are discussed and designed in real time through daily interactions of all stakeholders.

More broadly, the Genome Center aims to advance knowledge of disease pathogenesis, improving human health through preventive, diagnostic and therapeutic approaches, thereby realizing the social and economic benefits of genomics.

## EPFL Center for Neuroprosthetics

### **PROF. STEPHANIE P. LACOUR**

Innovation at the crossroad of neuroscience, engineering and medicine

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The EPFL Center for Neuroprosthetics (CNP) is an interdisciplinary research center that hosts over 180 scientists, engineers and clinicians driven to design and implement innovative neurotechnologies to diagnose, treat and assist people suffering from neurological disorders and trauma.

Research in the Center

encompasses bio-inspired neural interfaces, noninvasive brain-computer interfaces, machine learning, biomedical signal processing, robotics and neuroscience. Following an integrative approach, it aims to restore vision, enable sensorimotor control after spinal cord injury, stroke or amputation, and alleviate cognitive and psychiatric maladies.

The EPFL CNP was created in 2012. In 2016, all CNP groups – three from the EPFL School of Life Sciences and five from the EPFL School of Engineering, relocated to Campus Biotech, where the unique ecosystem promotes the exchange of ideas, experience-sharing and the advance of translational research. EPFL CNP members operate in the three world-class experimental platforms at Campus Biotech– Neural Microsystems, Preclinical Neuroscience and Human Neuroscience platforms and have longstanding partnerships with neighboring clinical institutions.

Most EPFL CNP projects involve two or more CNP teams excelling in the following fields:

- Soft and multimodal neural interfaces
- Micro-nanofabrication
- Imaging
- Machine learning
- Signal processing
- Brain-machine interfaces
- Robotics
- Translational research
- System neuroscience
  Healthy

- Neuromodulation
- Cognitive neuroscience
- Sensorimotor
  neuroprosthetics
- Sensory restoration (touch, vision and audition)
- Spinal cord injury and neural repair
- Stroke
- Healthy ageing

# **FLAGSHIP PROJECTS**

### **Global Health**

### **PROF. ANTOINE FLAHAULT**

#### **Research that transcends borders and disciplines**

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Global Health connects academic and non-academic partners to find solutions to complex health challenges. Campus Biotech provides an environment that allows Global Health to build the trans-disciplinary dialogue it needs to create new ways of treating sickness globally. The Campus' central location in international Geneva offers

unrivalled access to institutions that are some of the most committed to global health in the world. The space Campus Biotech creates for EPFL's engineering capacity to combine with the University of Geneva's academic capacity is unique and lends itself to innovative research than can be transferred directly to international policy makers at work in the city.

By attracting top scientists in the fields of neural network, deep learning, digital epidemiology and mathematical modelling, Campus Biotech keeps us at the cutting edge of scientific discovery. On another level, the Campus actively nurtures the lively spirit of "hackathon", drawing out the brilliant and bright ideas of young, enthusiastic researchers. They bring their own expertise and background, dedicating their time to finding ideas and proposals which no one has thought about before.

### **The Blue Brain Project**

### PROF. HENRY MARKRAM

Leading the world in modelling and simulation to deepen our understanding of cognitive functions

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The aim of the Blue Brain Project is to build detailed digital reconstructions and simulations of the complete mouse brain in order to learn more about its cognitive functions and behavior. By probing these functions we begin to understand the chain of events responsible for cognition and can translate these discoveries

into practical results for the fields of computing and medicine. Since 2015 the project has delivered a steady stream of publications based on its models and simulations, including ground-breaking research into unusual topological features of brain connectivity. In the next four years, Blue Brain will consolidate, broaden and deepen its modeling and simulation work, while simultaneously developing applications that can benefit both computing and medicine.

One of the greatest challenges facing this project – and neuroscience – today is fragmentation. Different neuroscientists ask different questions: they use different methods, different tools, different experimental animals. In order to gain a coherent understanding of the brain and its diseases we have to bring this diverse research together into an integrated whole. This is exactly the goal of Campus Biotech.

As one of the world's largest projects in fundamental neuroscience, the goals of the Blue Brain Project are at the heart of Campus Biotech's mission. From direct investment, to the creation of new laboratories and the organization of lectures from world-leading researchers, Campus Biotech offers invaluable support. The interdisciplinary culture on the Campus allows Blue Brain staff to learn from other researchers working in the fields of applied science, particularly those of neuroprosthetics, at the heart of Europe. "The vision of creating an environment that favours interaction between groups with complementary competencies is very exciting for the people working both in academic labs and also in companies located within Campus Biotech. The cornerstone of this wonderful edifice is the implementation of technical platforms which are not only based on the latest technologies and devices, but also on the know-how of the people operating the equipment."

#### PROF. LUC STOPPINI | HEPIA

Working in the field of regenerative medicine, one of the aims of HEPIA tissue engineering lab is to accelerate the development and validation of new generations of bio-electronic interfaces that can be implanted in the human brain. The first electrodes that could record activity in the human brain were developed in the 1940's, but there has been little progress in elongating the lifespan of those electrodes since then.

The emerging fields of electroceuticals, neuroprosthetics and brain machine interfaces depend on high quality neural recordings and the long-term integrity of such electrodes. Leveraging the ressources and platforms operated by both the Wyss Center and the Fondation Campus Biotech Geneva, the HEPIA tissue engineering lab is developing an in vitro platform based on human "mini-brains" to assess the long-term efficiency and robustness of new generations of electrode arrays before their eventual tests in vivo.

The interdisciplinary infrastructure of the laboratories and offices at Campus Biotech has been highly beneficial to Diagnostic-Biochips, combining both biological and engineering approaches. The extraordinarily quick transition in April 2014 from HEPIA to Campus Biotech allowed for an almost seamless continuation of work and progression to new proposals. The presence of neighbouring experts working on different projects has created unique opportunities for collaboration and mutual exchanges of technical expertise.

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# SUPPORTING SCIENTISTS

## Connecting the minds that are changing the face of modern medicine

Though Campus Biotech offers scientists state-of-the-art equipment and technology to pursue their projects, perhaps the greatest support we offer is opportunities to connect; to build a dialogue across disciplines and institutions. Partners and scientists based at Campus Biotech become part of a diverse, dynamic culture of knowledge exchange. Success can only be collective; dynamic collaborations between sectors develop organically to advance our understanding of neuroscience, and digital and global health.

This powerful ecosystem is supported by our facilities and services, but ultimately thrives on this connection between sectors. Connecting the academic community to industrial partners, the public sector to the private sector, and locally developed ideas to the wider world is our aim. This interdisciplinary approach drives medical breakthroughs, making sure the cutting edge of science translates into practical use in the real world.

"Personalized medicine will request more and more genomic analysis. In this context, HUG are proud to bring their medical know-how and to contribute to interdisciplinary research projects for the benefit of patients and science."

BERTRAND LEVRAT | CEO, HUG

"Around the world, public and personalized health is re-invented for the digital age. The Campus Biotech ecosystem, with its close proximity to WHO and other international organizations, is a unique place in the world, bringing together all the relevant stakeholders to shape this exciting development."

### PROF. MARCEL SALATHÉ | EPFL

Prof. Marcel Salathé's group, the Digital Epidemiology Lab, uses the new and rapidly growing digital data streams coming from the web and mobile devices in order to advance public and personalized health. These big data sets are then used by artificial intelligence algorithms to improve our understanding of the health and disease dynamics, both in individuals, as well as in the population at large.

In a world where billions of people generate and collect more and more healthrelevant data online and on mobile devices, the opportunities for more precise and efficient health services are enormous. From tracking personalized nutrition on mobile phones through automated image recognition, to measuring health trends emerging on social media platforms with natural language processing, the lab combines its life science expertise with its applied machine learning experience to shape the health care systems of the future. Based in both the life science and computer science schools at EPFL, Prof. Salathé and his group represent the interdisciplinary nature of modern research.

Prof. Salathé is also the founder and academic director of the EPFL Extension School, which is located at the Campus Biotech Innovation Park. The EPFL Extension School is providing online training for everyone to build and advance their applied digital skills, in areas such as data science, web development, and cybersecurity. Its mission is to enable everyone to learn the skills necessary to benefit from the opportunities of the digital age.

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"Campus Biotech's cutting edge facilities are instrumental in the growth and development of our R&D efforts. The invaluable network of scientific collaborators here ensures that we remain at the forefront of Data-Driven Medicine to be able to help patients."

### DR. JURGI CAMBLONG | CEO AND FOUNDER OF SOPHIA GENETICS

As the global leader in Data-Driven Medicine, SOPHiA GENETICS helps health care professionals better diagnose and treat cancers and hereditary disorders thanks to complex genomics and radiomics analysis powered by SOPHiA AI. The company achieves its mission of contributing to a more sustainable global health care system by providing equal benefits to all users, uniting experts in a gold standard health tech platform, and motiving expert knowledge sharing to enter a new era in health care, where the data used to help a patient today will benefit those of tomorrow. Adopted by more than 920 hospitals in 77 countries, SOPHiA has already supported the diagnosis of more than 320,000 patients worldwide.

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## 40,000m<sup>2</sup> total surface area

26,000m<sup>2</sup> of research facilities 8,000m<sup>2</sup> dedicated to the Wyss Center 5,000m<sup>2</sup> for the Human Brain Project and Blue Brain Project

## 1,000 work spaces A 300-capacity auditorium

600m<sup>2</sup> Data Center

- A 630m<sup>2</sup> childcare
  - 1 restaurant catering to 460 people

### MAP OF THE CAMPUS BIOTECH

- 1 | UNIGE (CISA, FAPSE, FACMED)
- 2 | MRI FACILITY
- 3 | INDUSTRY PARTNERS
- 4 | EPFL LABS (CNP)
- 5 | WYSS CENTER
- 6 | EXPERIMENTAL NEUROSCIENCE AND BIO-ENGINEERING (PNP AND NMP PLATFORMS, H2030 GENOME CENTER)
- 7 | ATRIUM, PUBLIC SPACE, CAFETERIA
- 8 | HUMAN BRAIN PROJECT (HBP)
- 9 | BLUE BRAIN PROJECT (BBP)
- **10** | CHILDCARE FACILITY
- 11 | DIGITAL AND GLOBAL HEALTH
- **12** | EPFL LABS (CNP)
- **13** | HUMAN NEUROSCIENCE PLATFORM
- 14 | CLINICAL & SLEEP RESEARCH UNIT
- 15 | CAMPUS BIOTECH INNOVATION PARK

"Campus Biotech is an ideal playground for our research on human brain plasticity and how it may be impacted by new technologies. Our research agenda has benefited tremendously from the scientific excellence, research infrastructure and diversity of viewpoints that Campus Biotech thrives to foster."

#### PROF. DAPHNE BAVELIER | UNIGE

Daphne Bavelier is an expert on how humans learn. In particular, she studies how the brain adapts to changes in experience, either by nature - for example, deafness - or by training - for example, playing video games. Initially trained in Biology at the École Normale Supérieure, Paris, she then received a PhD in Brain and Cognitive Science from MIT, Boston, MA and trained in human brain plasticity at the Salk Institute, San Diego, CA.

She has pioneered work on how digital technologies may be leveraged for brain plasticity and learning. Over the past 20 years, her lab has unraveled how playing fast-paced, action-packed entertainment video games, typically though to be mind-numbing, actually benefits several aspects of behavior. Exploiting this counter-intuitive finding, her lab now investigates how new media, such as video games, can be leveraged to foster learning and brain plasticity.

Daphne Bavelier now directs the Brain and Learning Laboratory, a Cognitive Neuroscience research team at the University of Geneva, Switzerland. Her expertise is also sought outside of academia. She is a co-founding scientific advisor of Akili Interactive, a company which develops clinically-validated cognitive therapeutics that exploit video games. She has been on steering committees of the World Economic Forum for projects such as the global agenda project on New Vision for Education: Unlocking the potential of technology', or the World Economic Forum Global Future Council on Human Enhancement.

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"As neuroscientists, philosophers, psychologists, computer scientists, economists and scholars from literature, the arts and the humanities, we value the dynamic environment offered by Campus Biotech to develop our interdisciplinary research aimed at better understanding emotions and their roles in cognition and behavior"

#### **PROF. DAVID SANDER**

I DIRECTOR OF THE SWISS CENTER FOR AFFECTIVE SCIENCES

Prof. David Sander's laboratory for the study of emotion elicitation and expression (E3 Lab) investigates the neuro-cognitive mechanisms that are involved in emotion and in other affective-related phenomena, such as stress or reward processing. Research in the laboratory is focusing on questions such as: how are our emotions elicited? How are they expressed? How can they be measured? What are their effects on cognitive functions like attention, memory, and decision-making? How are they represented in the brain and other parts of the body? How are they related to values? What do they have to do with morality? What are their links with well-being? How could a better understanding of emotion help in the treatment of emotion-related disorders such as depression or anxiety? Can machines recognize and express emotions?

These questions - and others - are at the core of the research programs and teaching activities of the Swiss Center for Affective Sciences (or CISA, for Centre Interfacultaire en Sciences Affectives), which is the first Center that moved to Campus Biotech, in 2013. Having started as a National Center of Competence in Research (NCCR) funded by the Swiss Confederation, the CISA is now integrated at the University of Geneva in Campus Biotech. As such, the CISA coordinates and integrates the activities of several important research groups at the University of Geneva and in other Swiss Universities that are focusing on affective processes. At the CISA, neuroscientists, philosophers, psychologists, computer scientists, economists, and scholars from literature, the arts, and humanities work together with the common objective of understanding emotions and their roles in cognition and behavior. The Center also develops methodologies and tools to study the neural, psychological, bodily and social underpinnings of emotion.

"At Campus Biotech, our team enjoys and benefits from numerous fruitful and catalytic interactions with colleagues from EPFL with engineering background and others from CISA with interests in psychology and humanities, giving our researchers the deepest knowledge and most efficient tools to conduct cutting edge research in cognitive and clinical neuroscience"

#### PROF. PATRIK VUILLEUMIER | UNIGE

Prof. Patrik Vuilleumier is co-director of the Brain and Behavioral Laboratory of the University of Geneva, faculty advisor of the Human Neuroscience Platform at Campus Biotech, and deputy director of the Swiss Center for Affective Sciences (CISA). After clinical training in Switzerland, France, UK, and USA, he specialized in behavioral neurology, neuropsychology, and neuroimaging with functional MRI and EEG. His research focuses on brain circuits of cognitive and affective processes, including attention, vision, and social emotion perception, as well as their disturbances due to neurologic or psychiatric illnesses. He conducted many influential studies on behavioral effects and neuroanatomical substrates of both conscious and non-conscious mechanisms of perception, particularly in relation to spatial neglect and blindsight after brain lesion, emotion recognition and emotion regulation, as well as neural mechanisms responsible for disorders in self-awareness associated with hypnosis and functional/psychogenic neurological disorders (hysteria).

A current line of research at Campus Biotech is to unravel the architecture and dynamics of distributed brain networks underlying the generation of emotions and explain how they can influence other networks responsible for action, decision making, memory, or cognitive control. This work combines virtual reality techniques and advanced neuroimaging approaches to understand network dynamics and connectivity. Another research program is to leverage real-time brain imaging methods such as fMRI and EEG to implement neurofeed-back protocols for therapeutic applications and rehabilitation. This work aims at restoring impaired functional interactions among brain regions in patients with neurological or psychiatric diseases, for example allowing them to directly regulate their brain activity after a focal lesion (such as stroke) or to regulate specific circuits implicated in emotion and emotion control in affective disorders (such as depression or anxiety).

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## "Campus Biotech has the potential to accelerate and transform research in translational neuroscience. I am thrilled to contribute to implementing this vision."

### PROF. GRÉGOIRE COURTINE | EPFL

The laboratory led by Prof. Grégoire Courtine – also known as the G-Lab – is committed to developing neurotechnologies that transform the treatment of neuromotor disorders resulting from spinal cord injury (SCI), stroke or Parkinson's disease. For example, the laboratory developed a multi-pronged therapy that restored walking in humans with SCI. This treatment involves a bioelectronic implant that delivers sequences of electrical stimulation bursts to the region of the spinal cord involved in the control of walking. Automated algorithms adjust the location and timing of the stimulation in real-time in order to ensure that the stimulation protocols coincide with the intended movements. This therapy enabled patients to take their first steps after years of paralysis. When combined with intense robot-assisted gait training, the stimulation promotes the growth of new nerve projections that re-establish a voluntary control of movement even without stimulation. Committed to translate this proof of concept into a commonly available therapy, Prof. Grégoire Courtine launched a start-up that is designing neurotechnologies optimized for this therapy.

The laboratory also continues addressing fundamental questions on the neural control of movement and neural repair mechanisms that are not only important for our scientific knowledge, but also have the potential to translate into new avenues to restore lost motor functions after neuromotor disorders. These studies rely on synergies between multiple experimental models including in silico simulations and in vivo experiments in rodent (Campus Biotech) and nonhuman primate (University of Fribourg) models of neurological disorders, as well as clinical studies that are conducted at the Lausanne University Hospital (CHUV) in close collaboration with Prof. Jocelyne Bloch, who leads the unit for functional neurosurgery. "Geneva has long been a special place where people and countries come together in a spirit of hope to work for change. This spirit of collaboration is part of the city's very fabric and is why Campus Biotech could have no other home in which to realise its vision for groundbreaking medical and neuroscientific research."

PROF. BENOÎT DUBUIS I DIRECTOR OF CAMPUS BIOTECH

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## "Early life events shape our brain-how to enhance early brain development is a fundamental question for future mental health and societal prosperity"

### PROF. PETRA S. HÜPPI | UNIGE

As a neonatologist and developmental pediatrician I have been interested in developmental brain injury that leads to functional deficits in children suffering from such conditions in early life. To study the developing brain non-invasively, I have been involved in the application of magnetic resonance techniques to the newborn brain since its beginning in 1987 and have contributed many hallmark studies on new imaging modalities for the developing brain, but the unique environment of Campus Biotech allows us for the first time to focus our research on the science of early child development and the concept that brains are built over time in an enriching pluridisciplinary environment. State-of-the art biomedical imaging as well as the national competence center in affective science are providing excellent synergies to build our hub of Child Development Science at Campus Biotech.

We study effects of adverse events prenatally, prematurity and its effects on brain development, both in structure and in function and provide new avenues of neuroprotection and enhancement of brain development, including studies on music and mindfulness, interventions. "The Catalyst Fund was created to promote and accelerate the transition of early stages technologies towards therapeutic solutions, for diseases (including rare diseases) that affect the brain, the spinal cord, the peripheral nervous system, as well as the sensory organs."

### ERNESTO BERTARELLI | ENTREPRENEUR AND PHILANTHROPIST AND MARTIN VETTERLI | EPFL PRESIDENT

Launched in 2017 by Ernesto Bertarelli and EPFL President, Martin Vetterli, the Catalyst Fund was created to promote and accelerate the transition of early stages technologies towards therapeutic solutions, for diseases (including rare diseases) that affect the brain, the spinal cord, the peripheral nervous system, as well as the sensory organs.

The vision for the five million francs fund mirrors that of Campus Biotech itself: innovation and, above all, collaboration. Each project includes one or more team from Campus Biotech, which join together with colleagues from partner research institutes. After a call for funding that drew proposals of a remarkably high calibre, five projects were selected in the Fund's first round, each receiving 300,000 francs to kick-start their research and to turn its results into clinical applications:

- OPTOGENETIC THERAPY TO RESTORE EYESIGHT Bernard Schneider (EPFL's Brain Mind Institute) and Sonja Kleinlogel (University of Bern)
- TREATING VISION PROBLEMS AFTER A STROKE
  Friedhelm Hummel and four colleagues from EPFL, HUG, Hôpital du Valais
  and the Clinique Romande de Réadaptation (Sion)
- TREATING HALLUCINATIONS IN PARKINSON'S PATIENTS
  Olaf Blanke and Dimitri Van De Ville (EPFL),
  Paul Krack (Geneva University Hospital)
- RESTORING FINE MOTOR SKILLS Tomislav Milekovic (University of Geneva), Marco Capogrosso (University of Fribourg)
- CONTROLLING THE PATHS OF PAIN Stéphanie Lacour (EPFL) and Isabelle Décosterd (Lausanne University Hospital – CHUV and FBM-University of Lausanne)

A new call for proposals for projects to receive Catalyst Funding is launched every Spring.

![](_page_42_Picture_0.jpeg)

![](_page_43_Picture_0.jpeg)

# INNOVATE COLLABORATE TRANSLATE

## Space to grow: Our ideas, and yours

Campus Biotech thrives on new ideas and approaches. We are a fluid system, open to new partnerships and collaborations that share our pioneering spirit. Just as the scientists working here harness our technical platforms to further their research, we welcome the opportunity to advance the ideas of academic and scientific partners wishing to join us.

## We still have space to grow

To sustain the needs for academic and private activities, we're working hard to develop new premises for research, innovation and services dedicated to scientists working on-site. Our aim is to provide a unique ecosystem to merge your activities in a dynamic and energising place dedicated to the translation of ideas into real solutions for the benefit of patient and population.

![](_page_44_Picture_5.jpeg)

# Are you ready to become part of our ecosystem?

### **Campus Biotech ecosystem includes:**

#### FOUNDERS

Bertarelli Family | fondation-bertarelli.org

École Polytechnique Fédérale de Lausanne (EPFL) | epfl.ch

Hansjörg Wyss | wyssfoundation.org

University of Geneva (UNIGE) | unige.ch

#### PARTNERS

Fondation Campus Biotech Geneva (FCBG) | campusbiotech.ch/en/partenaires Geneva School of Engineering, Architecture and Landscape (HEPIA) | hesge.ch Geneva University Hospitals (HUG) | hug-ge.ch Health 2030 Genome Center | health2030.ch/genome Swiss Institute of Bioinformatics (SIB) | sib.swiss Wyss Center for Bio and Neuroengineering | wysscenter.ch ENTERPRISES Addex | addextherapeutics.com Aga Khan Development Network | akdn.org Coremedicalabs | coremedicalabs.com FIND | finddx.org GliaPharm | gliapharm.com IFPMA | ifpma.org International Management School Geneva (IMSG) | imsgeneva.ch Sophia Genetics | sophiagenetics.com/home

### **RESEARCH TEAMS**

École Polytechnique Fédérale de Lausanne (EPFL) | epfl.ch

- Blue Brain Project (BBP) | bluebrain.epfl.ch
- Center for Neuroprosthetics (CNP) | cnp.epfl.ch
- Global Health Institute (GHI) | sv.epfl.ch/GHI-home
- Human Brain Project (HBP) | humanbrainproject.eu

### University of Geneva (UNIGE) | unige.ch

- Child Development Laboratory | neurocenter-unige.ch/research-groups/petra-huppi
- Cognitive System Neuroscience | neurocenter.unige.ch
- Faculty of Medicine: Medical Informatics | unige.ch/medicine
- Faculty of Psychology and Educational Sciences (FPSE) | unige.ch/fapse
- Institute of Global Health (ISG) | unige.ch/medecine/isg/en
- NCCR Swiss Center for Affective Sciences (SCAS) | affective-sciences.org
- NCCR Synapsy | nccr-synapsy.ch

### STARTUPS

Campus Biotech Innovation Park (CBIP) | epfl-innovationpark.ch/community/companies/campus-biotech/

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