EPFL

# 2030 Showcase

## Tech4Impact Presents:

## EPFL's Contribution to the Sustainable Development Goals

SUSTAINABLE DEVELOPMENT GOALS

# Foreword

*EPFL President Martin Vetterli*

Research and technology have always been an engine for innovation and change, just consider the industrial revolution, or the on-going digital revolution. But can they also be a driver for sustainability? I think they can, and I am convinced that as a world-leading scientific institution the EPFL bears a great responsibility and plays a critical role in this transition towards a sustainable society based on technology and innovation. However, the challenge of a sustainable technology requires interdisciplinary expertise. It requires an ability to see problems as a whole and to think across boundaries. These criteria are precisely at the heart of our technological school. As one of the two federal universities of Switzerland, we are leaders on pressing societal questions and thus need to come up with answers that address the grand challenges of our time.

The EPFL Showcase 2030 report reveals that a substantial number of our labs and scientists across all faculties and schools are committed to advance science for sustainability. Furthermore, we have spawned path-breaking start-ups that offer a variety of market-ready sustainable solutions. Last but not least, we have an astonishing number of activities devoted to advance sustainability. Our several programs, from the Campus Durable, to Tech4Impact, up to student initiatives like Unipoly or Ingénieurs du Monde – they all do fantastic work in promoting sustainability on our campus, and beyond. At the same time, the report also reveals critical gaps and areas for continuous development.

In short, in times of upheaval and change, we want to embrace the challenge of sustainability as an opportunity for our 50 year young school. And for me personally, there is nothing more inspiring than to work for a school like ours that is devoted to the future of our planet and our society.

April 2019

Martin Vetterli
President of EPFL

# 2030 Showcase

## Mapping EPFL's Contribution to the Sustainable Development Goals

The UN Agenda 2030, which has been adopted by 193 UN members at the historic Climate Change Conference 2015 (COP 21) in Paris, is widely acknowledged as the most universal and transformative agreement in our pursuit towards a sustainable future. At the core of the UN Agenda lie 17 global goals (with 169 sub-goals), the so-called 'Sustainable Development Goals' (SDGs), which reflect and address the multitude of economic, environmental, and social challenges of the 21st century.

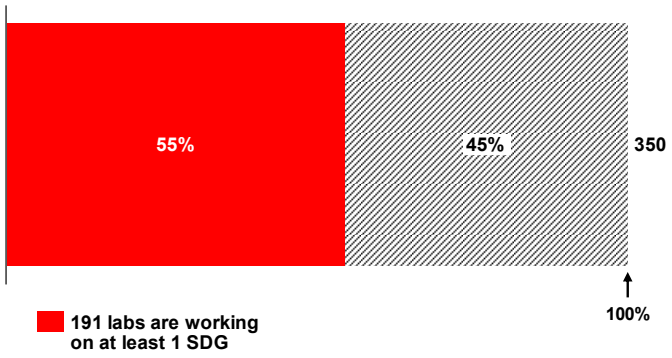
What is the role of a university, particularly a federal technological university, in achieving the UN Agenda 2030? While formulated as a political strategy, the SDGs provide a clear mandate and a compelling framework for education, research, and innovation – thereby influencing all three missions of EPFL. From an educational perspective, we are challenged to integrate sustainability in the curriculum and to develop the next generation of responsible leaders. We are called upon to not only create awareness for the multitude of problems our ecosystems and society are facing, but also to provide students with the tools, skills, and confidence to address these challenges. To achieve this ambitious goal, EPFL's scientific research and technological innovation play a crucial role to address today's problems and pursue tomorrow's opportunities.

The Showcase 2030 Report, conducted by EPFL's Tech4Impact Initiative, is a first attempt to systematically map EPFL's contribution to the UN Agenda 2030 and is part of the University's wider efforts to broaden its societal impact in the areas of education, research, and innovation. While this Report is the most systematic mapping attempt to date, it can only be seen as a first step towards achieving a truly comprehensive and holistic overview. It is therefore our goal to continuously update the list of labs and their contribution to the SDGs, in order to provide a dynamic and real-time overview, which can be used as a practical guide by public, institutional, business, and non-profit actors alike.

The Report provides an overview of the results, a presentation of some of EPFL's sustainability best practice examples (sorted by SDG), and is followed by a synopsis of all the research labs, research centers, as well as EPFL spin-offs that are currently working on at least one of the SDGs.

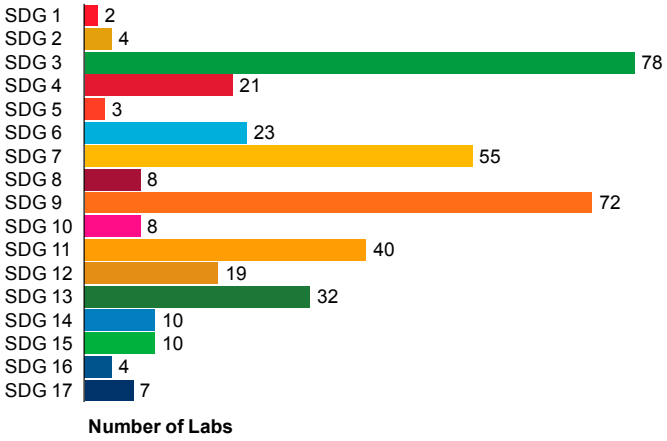
# OVERVIEW OF RESULTS

## 191 EPFL Research Labs Address the UN's Sustainable Development Goals



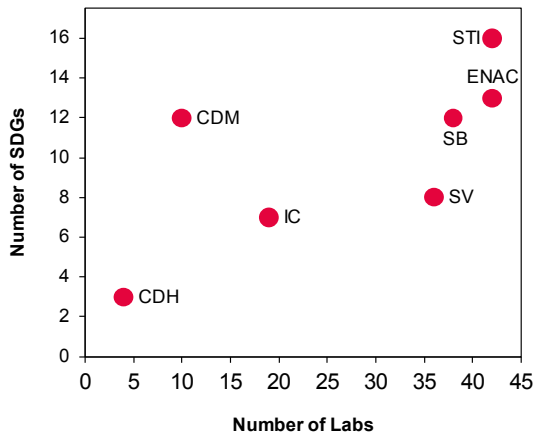

The first Sustainable Development Goal (SDG) Report at EPFL provides impressive evidence of the University's potential to advance the UN 2030 Agenda for Sustainable Development. According to the survey's results, 191 out of 350 research labs address one or more of the SDGs in their research projects. From tackling essential technology needs in emerging countries to addressing the global energy needs of tomorrow, these disruptive research projects provide innovative technological solutions to the most pressing global challenges of our time.

## Strong Research Focus on SDG 3, SDG 7, and SDG 9




The report reveals that EPFL labs are working on a wide variety of research projects addressing the 17 SDGs. A notable finding is that the vast majority of EPFL labs focus on SDG 3 (good health and well-being), SDG 7 (affordable and clean energy), as well as SDG 9 (industry, innovation and infrastructure). The results thereby aptly reflect the University's past performance in research areas as diverse as health, energy, or engineering. In this respect, EPFL has often been considered as one of the prime actors in the "Health Valley" of the Lake Geneva region, demonstrated by its strong contribution of innovation toward medtech, biotech, pharma or nutrition (SDG 3). In addition, EPFL's multidisciplinary research approach to address the transition toward renewable energies and new energy solutions has been widely acknowledged and is one of the corner stones of the University's strategy for the upcoming years (SDG 7). More generally, the results demonstrate that the stronger the link between SDG and technology (i.e. the potential to achieve the SDG by means of technological solutions (e.g. SDG 9), the more labs are devoting efforts to work on the SDG and the higher the potential for EPFL research to contribute to achieving this SDG.

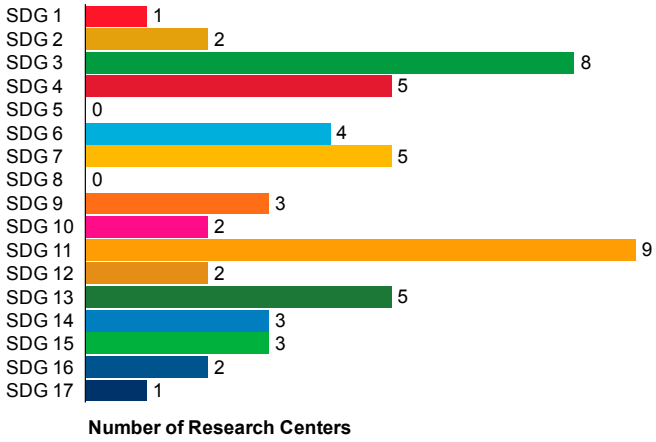
## More Faculty Involvement Leads to Greater SDG Research Diversity




Looking at the different schools and colleges at EPFL, it is evident that that if there is a larger number of labs working on the SDGs in that school, the school also addresses a higher diversity of SDGs.

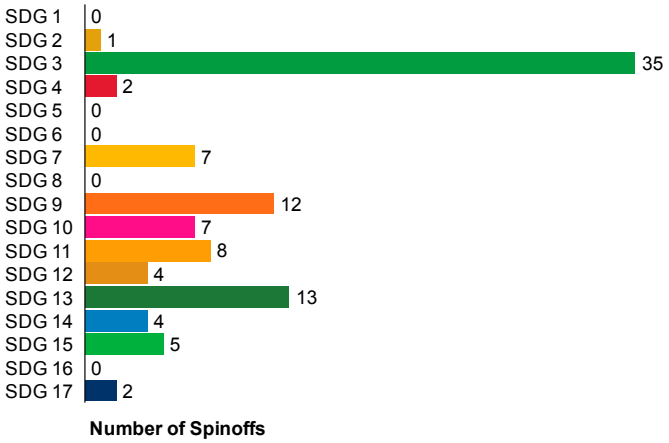
The School of Engineering (STI), the School of Architecture, Civil and Environmental Engineering (ENAC) and the School of Basic Sciences (SB) are all examples of schools where a very high number of labs (over 35 labs per school) are involved in a wide variety of SDG-related research endeavours (over 12 SDGs per school addressed). The School of Life Sciences (SV) is an exception to this rule. SV reflects an equally high faculty involvement, yet the variety of the SDGs addressed (8 SDGs) is lower, because the school dominantly focuses on health-related research (SDG 3). Compared to the four other schools, the School of Computer and Communication Sciences (IC) has a lower faculty involvement and addresses a lower number of SDGs, yet with the unprecedented development of digital technologies affecting all areas of human life, we can expect an increase in SDG relevant research of this school in years to come. Lastly, the College of Humanities (CDH) and the College of Management of Technology (CDM), despite having a significantly smaller number of faculty as compared to other the schools, still make a notable contribution to advancing research on the SDGs, with CDM reflecting a very high variety for the rather small number of labs involved.

## Thematic Research Centers Promoting Interdisciplinarity and Collaboration




EPFL research centers are thematic research hubs, which bring together several labs at EPFL and/ or other universities to promote the interdisciplinary discovery of strategically relevant topics. Considering the complex and interwoven nature of today's social and environmental challenges, these collaborative centers are particularly well-positioned to advance science and technology for the goals. A first notable result of our study is that out of the officially 35 research centers at EPFL, 20 address one or more of the SDGs (57%). These 20 labs tackle a variety of relevant research areas and this diversity is reflected in the balanced distribution among 15 different SDGs. While health-related research is once again among the primary focus areas (SDG 3), an interesting finding is the emphasis on SDG 11 (sustainable cities and communities). In this respect, research centers that focus on the understanding, prevention and advancement of cultural heritage make an important contribution to advancing science on SDG 11.

## EPFL Spin-Offs Driving Switzerland's "Health Valley"




EPFL spin-offs (i.e. start-ups founded by the members of the University), show a track record of entrepreneurial activity for about 30 years. While it is difficult to estimate the total number of spinoffs, we were able to identify a total of 65 active EPFL spin-offs addressing one or more of 12 different SDGs. In the case of the start-ups, the reference of the Lake Geneva region as "Health Valley" – inspired by the famous "Silicon Valley" – is even more evident: more than half of the spin-offs (53%) are related to innovations in the health tech ecosystem (SDG 3). While lagging far behind in numbers, a fair share of start-ups are working on topics related to SDG 13 – Climate Action. Many of these ventures provide break-through technologies that range from significantly reducing greenhouse gas emissions (e.g. Daphne Technologies), to the prevention of natural disasters (e.g. Sensorscope). What all the identified EPFL spin-offs have in common is an innovative technology that has the potential to advance the UN Agenda 2030.

# 1 NO POVERTY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SDG 1 @EPFL

**2 Schools 2 Labs**


**Number of Labs per school**

# EssentialTech Centre

Some technologies are essential for development and humanitarian action; notably technologies related to medical devices, pharmaceuticals, energy, water and sanitation, food & nutrition, transports, information & communication, and construction. Unfortunately, these technologies are mostly inaccessible or dysfunctional when translated to low-income or humanitarian contexts.

Radiology in a district hospital in Cameroon. While it is essential for diagnosing severe problems such as fractures, Tuberculosis and Pneumonia, 2/3 of humanity has no access to such medical technology. ©EssentialTech, Sylvain Liechti 2015

The **EssentialTech Centre** leads technology innovation projects for development and humanitarian action. The approach is entrepreneurial: each technology is developed along with a business model in order to generate a sustainable and large-scale impact. The Centre has a successful record of accomplishment: 1) a complete digital medical x-ray system was designed and a spin-off was created which was able to attract CHF 14M in investment. 2) A dynamic prosthetic foot was designed in collaboration with the ICRC, which costs 10x less than existing solutions.

EssentialTech, along with its Swiss and African partners developped GlobalDiagnostiX : a robust, low-cost digital medical x-ray imaging system adapted to the context of low-income countries. ©Guillaume Perret

Extreme poverty is a highly multidimensional issue; essential technologies play a role in virtually all of the SDGs. In spite of the general reduction of extreme poverty levels in the world in the last decades, some countries remain deeply affected and, if current trends persist, will fare even worse in the coming decade. These countries are mostly in sub-Saharan Africa, hence the Centre's focus on "Africa first".

Design of a dynamic, low-cost prosthetic foot, in collaboration with the International Committee of the Red Cross. @Isaac Brown

The Centre's unique methodology, has yielded innovative technologies that promise to have sustainable impact in development and the humanitarian sector. Future work aims to focus on key areas, such as mental health, Ai for nutrition and health, sustainable urban construction, as well as establishing strong links between innovation communities in Africa and EPFL.

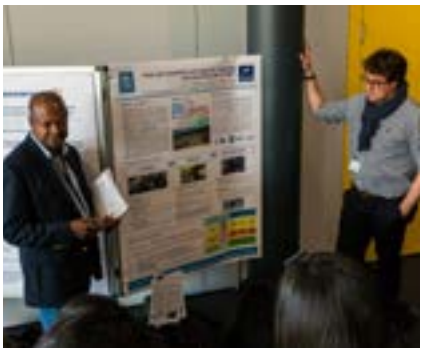
Essential Tech Center
Contact: Klaus Schönenberger
https://essentialtech.center/

*Further SDGs*

UNESCO Chair in Technologies for Development

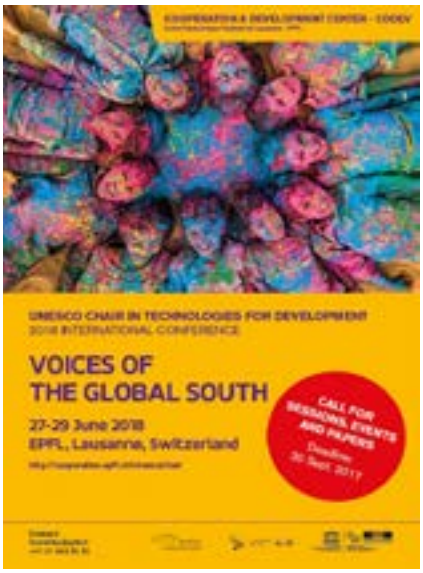
# International Conference

Technology- and science-based innovation that address global development challenges have a key role to play in achieving the Sustainable Development Goals. Platforms such as think tanks and international conferences are needed for academics, private sector actors, policy makers and practitioners to jointly develop robust solutions that address global challenges.



The Tech4Dev Conference is a flagship event of the UNESCO Chair in Technologies for Development hosted by CODEV at EPFL. The Conference focuses on the sustainable development potential of technological solutions in the fields of: 1) Humanitarian Action; 2) Medical Technologies; 3) ICT for Development; 4) Access to Sustainable Energy; 5) Disaster Risk Reduction and 6) Sustainable Habitat and cities.

Every two years, 500 stakeholders from over 70 countries come together at EPFL to discuss how cutting-edge technologies can advance the implementation of the Agenda 2030. The Tech4Dev Conference draws a growing global audience including leading universities of the world and positions EPFL as an innovation hub in technology for development and humanitarian action.




Tech4Dev at CODEV

Contact: Silvia Hostettler

https://cooperation.epfl.ch/tech4dev-conference-vision/

*Further SDGs*

# 2 ZERO HUNGER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SDG 2 @EPFL

**2 Schools 4 Labs**


**Number of Labs per school**

# Info4Dourou2.0:
## Smart Water Management for Dryland Agriculture in (Semi-)Arid Areas

In a context of climate change and growing pressure over water resources, North and South partners from the private, public and academic sectors worked together to improve water management of small-scale irrigation systems.

Info4Dourou2.0 is a flagship research-action project of the UNESCO Chair in Technologies for Development hosted by the Cooperation and Development Centre (CODEV) at EPFL. The technology is a robust, autonomous wireless sensor technology adapted to extreme climatic conditions, which provides local smallholder farmers with specific information to avoid water stress, using a simple SMS. The system makes the information available to the local community using a simple technique: when the soil becomes too dry, producers receive a text message alerting them that the plants need water and that irrigation should be triggered. The data is also available on the web for remote users. Tests have been conducted in Burkina Faso and Palestine from 2012 to 2018.

The project aims to achieve sustainable impact on the field through technology transfer for local manufacture of the technology and scientific dissemination of knowledge. Our research aims at bringing a strong contribution to the SDGs through:

- improved food security (SDG 2)
- sustainable management of groundwater resources (SDG 6)
- resilience to climate change (SDG 13)
- improved livelihoods for smallholders, with a specific focus on women farmers (SDG 1,SDG 5)
- transdisciplinary research (SDG 17)

Info4Dourou2.0 is contributing to sustainable development by improving water resource management for smallholder farming, strengthening food security and local economy, and enhancing climate change resilience.

Cooperation and Development Center (CODEV)
Contact: Clémence Bouleau
https://cooperation.epfl.ch/

*Further SDGs*

# Accumulation of Arsenic in Rice Grains: The Role of Microbial Transformations

Rice is a staple for over half of the world's population and ensuring the quality of rice is of major importance. However, the rice plant is a hyperaccumulator of arsenic, resulting in the presence of arsenic in rice grains from most cultivars due to the ubiquity of arsenic from geogenic sources.

The most salient question is what soil characteristics control the bioavailability of arsenic to the plant. Microbial arsenic transformations such as reduction and methylation can make it bioavailable. Our research focuses on microorganisms that carry out these transformations and ways to control their activity. The presence of arsenic in soil is not avoidable but its bioavailability is.

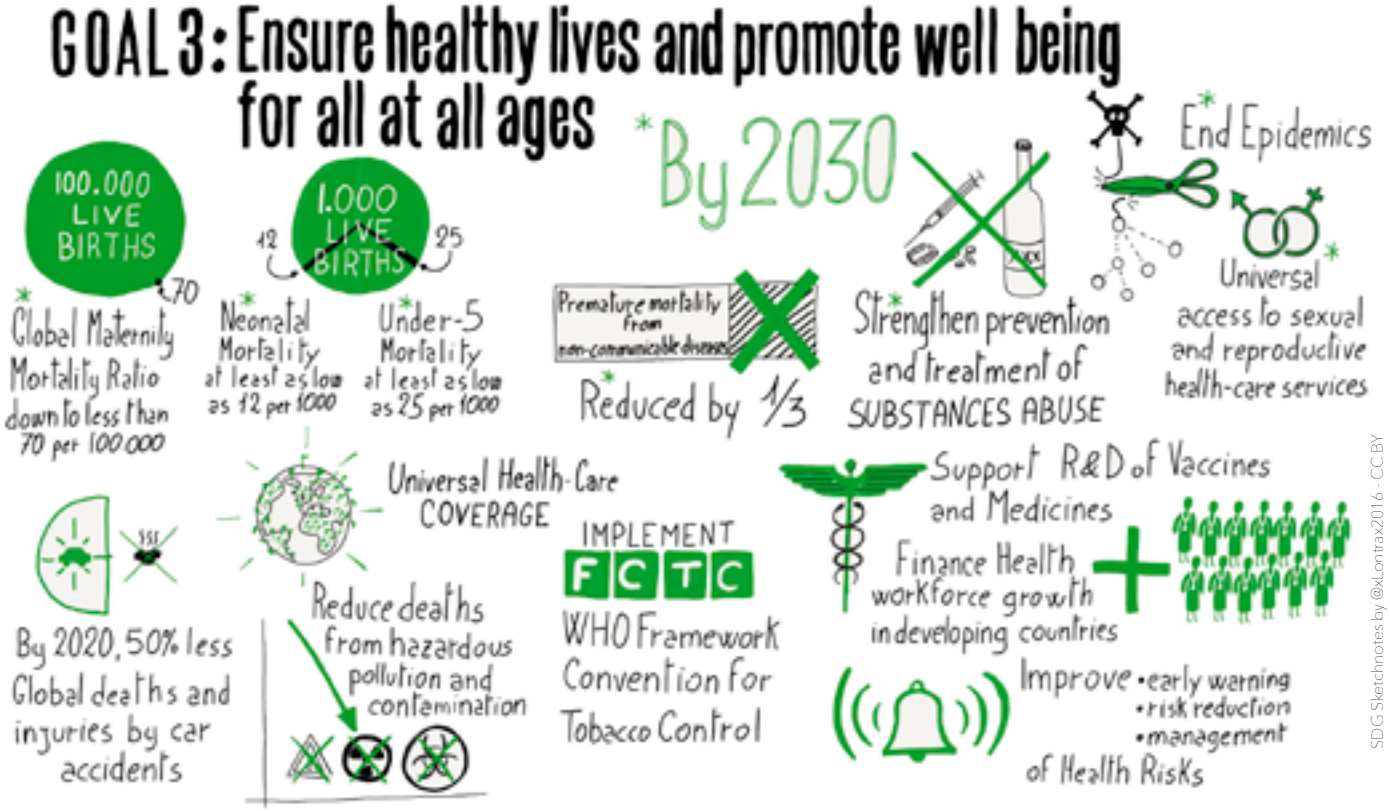
The research carried out at the Environmental Microbiology Laboratory at EPFL targets SDG 2, food security, and SDG 6, water and sanitation. Results from this work will help improve food quality and ensure that the inadvertent consumption of arsenic in rice is minimized and the associated health risks avoided.

Ongoing work involves a combination of state-of-the-art tools from microbiology and geochemistry and involves researchers from Switzerland and Vietnam. Agricultural practices that minimize the activity of key arsenic-mobilizing microorganisms are the major expected practical outcome of this work.

Environmental Microbiology Laboratory (EML)
Contact: Prof. Rizlan Bernier-Latmani
https://eml.epfl.ch/

*Further SDGs*

# 3 GOOD HEALTH AND WELL-BEING

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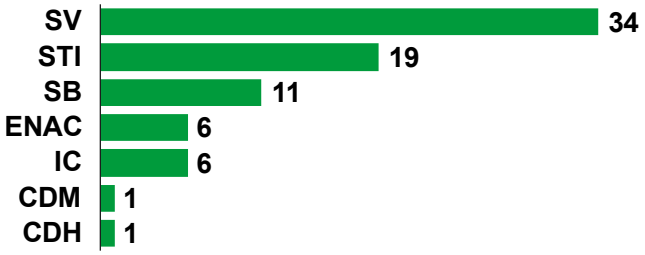
SDG 3
@EPFL

**7 Schools 78 Labs**




**Number of Labs per school**

Neurotechnologies to Restore Sensorimotor Functions After Neurological Disorders

# Neuromodulation 2.0

Neurological disorders such as spinal cord injury, Parkinson's disease or stroke disrupt the communication between the brain and spinal cord and/or alter the functions of circuits. These changes lead to a range of neurological deficits that severely affect the quality of life of affected people.

Professor Courtine's Group, which is part of the Center for Neuroprosthetic and Brain Mind Institute at EPFL, is developing targeted spatiotemporal neuromodulation therapies that aim to restore the communication within the nervous system and circuit functions after neurological disorders, with the objective to restore sensorimotor functions. We combine these therapies with neurorehabilitation and neural repair interventions. Our neurotechnologies are aligned with SDG 3, as we are developing ecological neurotechnologies that aim to improve health and well-being of humans.

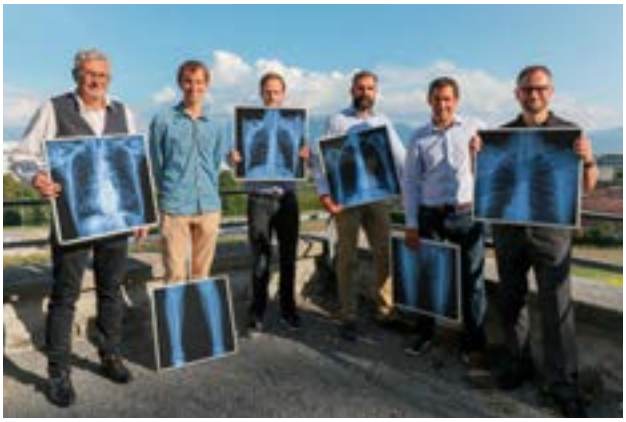
Our initial developments have been focused on paraplegics. While we continue optimizing our neurotechnologies to restore walking in paraplegics, we are also broadening the scope of our developments with neurotechnologies that target the recovery of upper limb movements in quadriplegics, and the recovery of sensorimotor functions in people with Parkinson's disease and stroke.

Prof. Courtine Group
Contact: Prof. Dr. Gregoire Courtine
https://courtine-lab.epfl.ch

# Pristem

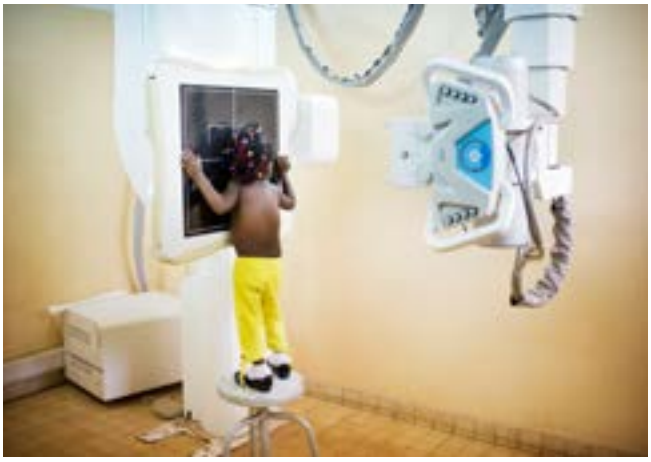
## All-In-One, Robust Digital Radiology System to Improve Globally and Durably Access to Advanced Medical Imaging Services

The World Health Organization estimates that two-thirds of humanity still have no access to radiology, although this basic technology is necessary for making appropriate diagnosis required to improve and save many lives (e.g. in case of broken bones or tuberculosis). A consortium of 20 research institutes from Switzerland and Africa was created in 2012, to develop an innovative medical imaging technology able to work without expensive infrastructures in any environment, including those where traditional solutions fail.



Pristem core team. ©EPFL, Alain Herzog & Jamani Caillet

Under the lead of EPFL EssentialTech centre, the project resulted in 3 patents and a feasibility prototype demonstrating a robust and cost-effective solution, easy to operate and maintain by non-experts. A spin-off company, Pristem SA, has been created to industrialize and deploy the new technology. Pristem's mission consists in improving globally "Good Health & Wellbeing" (SDG3) by addressing the problems of increasing costs of health care and lack of access to modern medical technologies.



Radiology patient in CHU of Yaoundé, Cameroon, on a stall as the positioning mechanism is broken. ©EPFL, Sylvain Liechti

Pristem strives to become a market leader in the provision of universal and sustainable access to cutting-edge medical imaging technologies and services. For that purpose, the company aims at continuously increasing its global reach, ensuring its financial strength, and improving its products efficacy, reliability, durability, affordability and servicing. To achieve its mission in a scalable and sustainable way, Pristem develops swiss-quality solutions, together with advanced maintenance technologies, e-health services and disruptive business models.

Pristem
Contact: Bertrand Klaiber
https://pristem.com

*Further SDGs*

# Artificial Intelligence for Health

The rapid and open development of modern AI, largely based on deep learning approaches, has led to an enormous diversity of available AI "solutions" to health problems. However, many of these openly available solutions have not been formally tested or approved, leading to substantial confusion and slow adoption in the field of AI & health.

The ITU-T Focus Group on Artificial Intelligence for Health (AI4H) was established by ITU-T Study Group 16 at its meeting in Ljubljana, Slovenia, 9-20 July 2018. The Focus Group will work in partnership with the World Health Organization (WHO), and Prof. Marcel Salathé (EPFL) as a Vice-Chairman to establish a standardized assessment framework for the evaluation of AI-based methods for health, diagnosis, triage or treatment decisions. Through such open and community-managed benchmarks, AI applications are expected to get faster and broader adoption, generating a strong positive impact on global health.

The Focus Group held its first meeting at the World Health Organization's headquarters in Geneva, Switzerland on 25-27 September 2018. The second meeting was held at Columbia University in New York from 14-16 November - during this meeting, eight use cases were accepted that ranged from assessing the risk of breast cancer to identifying snake bites. The third meeting was held at EPFL from 22-25 January 2019 with a total of 200 participants representing all stakeholder groups.

AI4Health *Further SDGs*

Contact: Prof. Marcel Salathé

https://salathelab.epfl.ch/

# 4 QUALITY EDUCATION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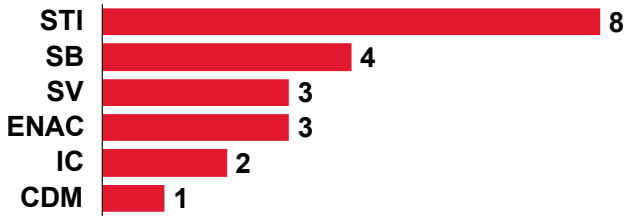
SDG 4 @EPFL

**6 Schools 21 Labs**




Number of labs per school

# LEARN
## The EPFL Center for Learning Sciences

There is increasing consensus that education has to adapt to the conditions of the digitally transformed world, on three levels:

- integrate digital tools
- teach and learn skills needed for future employability and participation in the society
- use data to manage educational systems (schools, classes, continued training)

If educational actors want this transformation to succeed, they need to consider results from research. If researchers want to contribute to this transformation, their research needs to be translational.
The Center for Learning Sciences drives translational research on digital education and teaching and learning in STEM. We develop innovations through a process that transforms research results into concrete implications for education. Field and large-scale projects allow to translate but also to inform the research about needs of practitioners. Our approach is to be as evidence-based as possible such that translational research can happen, and as pragmatic as necessary in order to reach our goal of having an impact.

Doing so, LEARN has a direct impact on at least four of the Sustainable Development Goals:

**SDG 4:** LEARN creates mechanisms that assure continuous evolution of education to adapt to current and future challenges

**SDG 5:** LEARN includes gender equality as a transversal consideration in all projects. For instance, the way we integrate computational thinking in primary schools seeks to attract girls' interest and to develop positive self-concepts in that domain.

**SDG 8:** LEARN's action also targets the curriculum. We work towards the inclusion of 21st century skills in all levels of education, from primary school to lifelong learning opportunities.

**SDG 17:** The translational approach of LEARN is intrinsically based on partnership. Only increased collaborative efforts allow to bridge the gap between learning science and educational reality.

LEARN implements translational research in (digital) education at EPFL and creates a community to establish an evidence-based culture to innovation in teaching and learning. The expertise developed in this process is provided to all actors in education.

LEARN
Contact: Prof Francesco Mondada
https://learn.epfl.ch/

*Further SDGs*

# MOOCs
## Massive Open Online Courses at EPFL

Education is among the main drivers of development to address the challenges set out by the Agenda 2030 in all areas. With the advent of Massive Open Online Courses, top universities have made their knowledge available online to anyone interested. This innovation in digital education has democratized access to education.

Since 2012, EPFL has produced more than 100 online courses in science and technology and made them available via the Coursera and edX platforms. More than 2 million learners form all countries in the world have registered for the courses and more than 120'000 participants have successfully finished a course.

With their focus on higher education, MOOCs complement other initiatives to foster access to education at primary and secondary levels. The program MOOCs for Development that EPFL has put in place especially targeted sub-Saharan African countries and contributed to strengthen local production capacities and pedagogical innovation.

Advances in online education contribute to making high quality education available for all. The full potential of these innovations however relies on progress with regards to internet availability.

Jürgen Brugger (MEMs and nanofabrication) records his MOOC in one of our studios at CEDE.

MOOCs at EPFL
Contact: Patrick Jermann
https://moocs.epfl.ch/

# BA 1st Year Introduction to "Global Issues"

To tackle the challenges of the 21st century, future scientists and engineers have to understand the interplay between societal challenges and technical solutions as early as possible in their education. In 2013-14, the Global Issues course in the College of Humanities (CDH) Social and Human Sciences program was introduced as a compulsory course for all first-year students at EPFL.

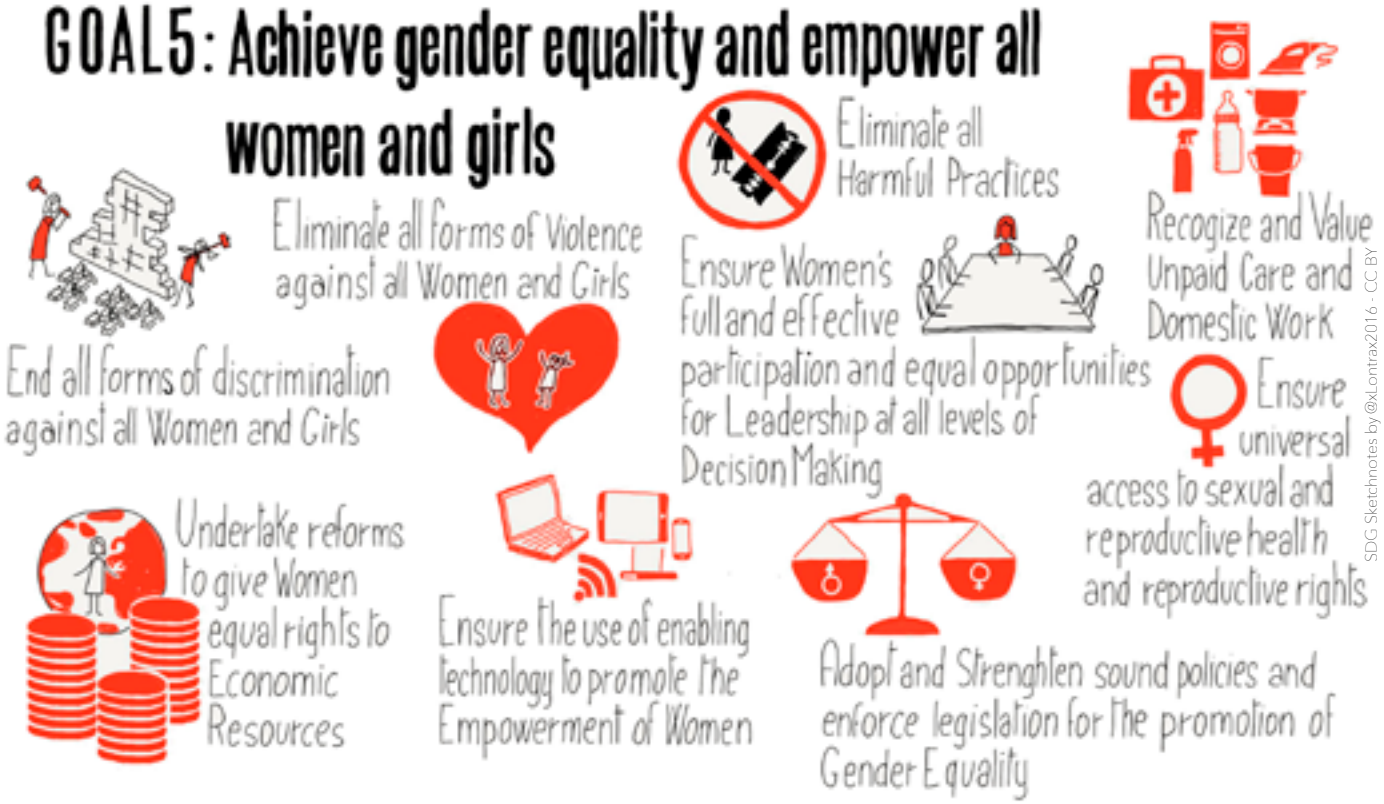


The course is highly innovative and interdisciplinary, and focuses on six major global issues: climate, communication, energy, food, health and mobility. Each of these six issues is the subject of a class taught by a two-person team, drawing from natural sciences and engineering on one hand, and from social and human sciences on the other. The course also requires students to engage in interdisciplinary group work. Each year, the three best student posters from the course are chosen for special recognition during an award ceremony and conference.

The Global Issues course is a notable example of the CDH POLY-perspective vision, which brings together research, education and public engagement activities within a framework of interdisciplinarity, global awareness, active citizenship and creativity.

CDH -Global Issues
Contact: Christine Farget
https://www.epfl.ch/schools/cdh/


# 5 GENDER EQUALITY

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SDG 5 @EPFL

**1 School** **3 Labs**

**STI** 3

**Number of labs per school**

# EPFL WISH Foundation

Since 2006, EPFL WISH has been independently encouraging the research & promotion of women by providing the tools, role models, financing, networks and support at key moments in these young women's careers at EPFL and beyond.

We offer mentorship programs and discussion round tables, create role models, give fellowships to outstanding students to perform their master thesis abroad, offer prizes to outstanding women who are changing the face of science (Erna Hamburger award).

Our activities are directed at reducing gender equality (SDG 5) in science and technology related professions. Our aim is to identify and support actions, which will help, reduce this dropout rate between those who study science, engineering and architecture and those who go on to make a career in these fields. Women will face a multitude of obstacles during their studies and careers, which is why it's crucial to support, network, and offer assistance, to these young female scientists, engineers, and architects to help them to achieve the career they merit. Our goal is to educate these students ahead of time, because often they don't realize the difficulties until it's too late. The WISH Foundation's objective is to try to provide financial "coup de pouce" to women at crucial times in their careers.

We strive to stay involved with the community and raise awareness of the leaky pipeline for women in science, architecture, and engineering.


EPFL WISH Foundation
Contact: Anna Fontcuberta i Morral
https://www.epflwishfoundation.org/

*Further SDGs*

# Polyquity


Polyquity is an association at EPFL, attached to Agepoly (students' association). We are an association promoting gender equality on the EPFL campus. We organize several recurrent and punctual events to make students more aware of issues regarding gender and sexism.

Working towards a more egalitarian environment at EPFL for students and reducing gender inequalities on the campus is a long-term goal EPFL has to reach to be sustainable, indeed about half the world population is female! The campus has to become a place where everyone feels safe and represented, in particular gender minorities. A saying of one of Polyquity's founders is "Polyquity's goal is to no longer have a purpose", we like to think along this line of a hopeful future for men, women, and everyone in between.

Polyquity
Contact: Polyquity@gmail.com
http://polyquity.agepoly.epfl.ch/

Other SDGs

# GirlsCoding

Young women often do not see computer science as a valid career choice, because of a lack of role models and prevalent gender stereotypes, resulting in only around 12% of computer science students at EPFL being women.

GirlsCoding was created at EPFL by a group of graduate students at the Audiovisual Communications Lab. Our goal is to motivate kids -- and especially girls -- to learn about computer science by sparking their curiosity and engaging their creativity through a series of hands-on workshops. In each of our workshops, we take a group of 9-16 years old kids on a journey of discovery, to find out what computer science is, how computers think, and what the life of a coder is like.

Breaking gender stereotypes and empowering women from a young age to enter domains of work and life (e.g. computer science or engineering), which were traditionally considered "male domains" is an important step towards gender equality (SDG 5). Performing this by means of education (SDG 4) promises a more sustainable shift in outdated mindsets.

Girls Coding
Contact: Miranda Krekovic
https://girlscoding.org

*Further SDGs*

# EPFelles

## A student's association for female, trans and non-binary students

Realising and experiencing that women at EPFL are still too often underrepresented and overlooked, we felt it was important to create a community of female students so that we all feel more welcomed, encouraged and less isolated in a space mostly occupied by men.

We strive to create a community of female, trans and non binary students at EPFL, to facilitate their integration and support them in their student life.

We organise study sessions, aperitifs, both professional and social, as well as conferences, workshops in coordination with companies and other associations. We promote female role-models in the STEM field, both at EPFL and externally.

Our activities aim to move gender equality forward on campus. Our activities allow students to meet women in STEM working in research or the private sector to gain contacts, career opportunities or simply insight to what they can do someday. We believe these kind of activities can help women gain the same opportunities as men (SDG 5).

We are a new association at EPFL, but already have over 1000 members on our Facebook group and over a 100 community members. We are happy being able to respond to the demand for a female community at EPFL.

EPFelles
Contact: Anna Häägg
https://epfelles.ch/

# 6 CLEAN WATER AND SANITATION


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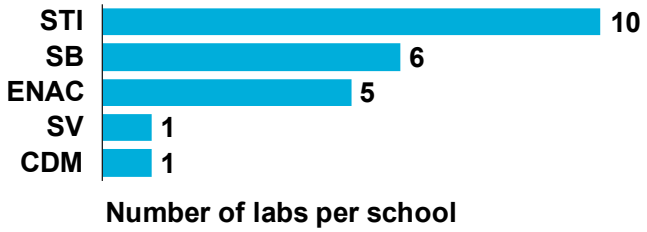
SDG 6
@EPFL

**5 Schools 23 Labs**



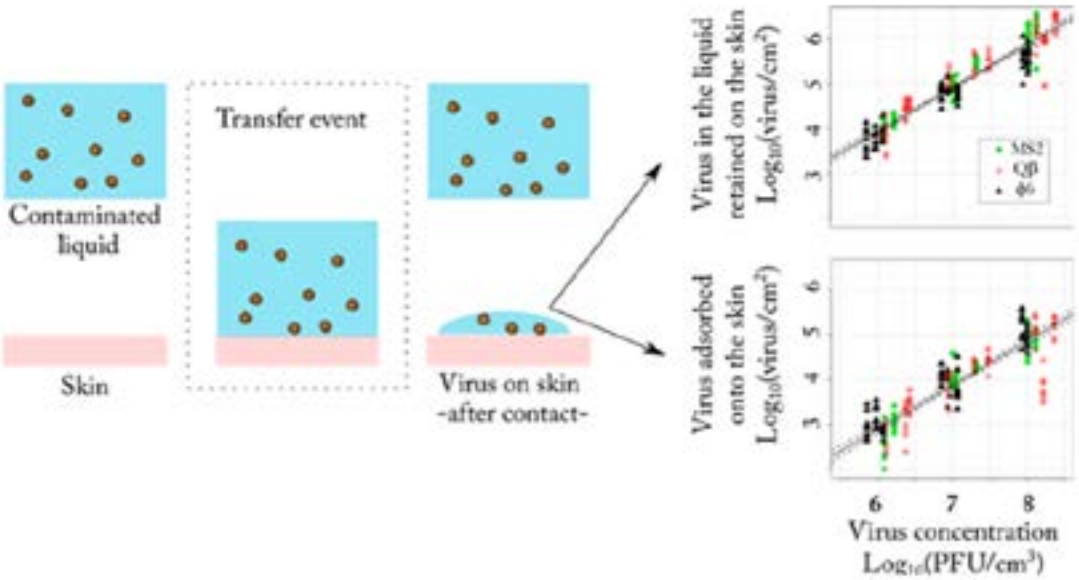
# Collaboration between the Swiss Federal Institute of Aquatic Science and Technology (Eawag) and EPFL on SDG 6 Topics

Eawag is a leading institute for research, education, and consulting in aquatic science and technology. Eawag's research focuses on concepts and technologies to achieve and maintain a sustainable balance between meeting direct human needs for water and preserving the capacity of the water environment to provide ecosystem services.

Eawag cooperates with EPFL through the appointments of joint and adjunct professors, co-supervision of doctoral students, collaborative research projects, and course instruction including the MOOC series on water, sanitation and hygiene (WASH). Joint research projects between Eawag and EPFL researchers include studies of liquid-to-skin virus transmission.

SDG 6 aims to "ensure availability and sustainable management of water and sanitation for all". In 2015, however, 73 per cent of the population in less developed countries lacked basic handwashing facilities. Handwashing is an important measure to reduce disease transmission and promote human welfare and social and economic development.

There are many opportunities in research and education to support sustainable development projects with robust knowledge, tools and scientific methods.




The virus load remaining on skin after exposure to contaminated liquid is proportional to the original virus concentration for both virus adsorption onto the skin and for retention of residual contaminated water. ©Pitol, Bischel, Kohn and Julian (2017) Environ. Sci. Technol., 51: 14417–14425.

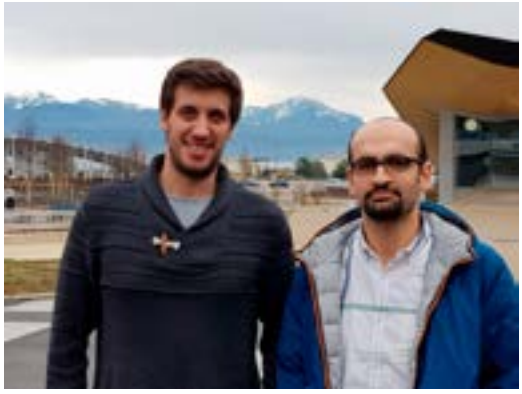
EAWAG
Contact: Prof. Janet Hering
https://www.eawag.ch/

*Further SDGs*

# DROP
## Disinfection Reactor for Organic Pollutants

More than 800 million people still suffer from lack of access to potable water worldwide. Water contamination kills one person every 30 seconds. On-site chlorination is a simple and effective means to disinfect water, but its utilization if often hampered by high costs and poor efficiencies.

**DROP** is a project that will evolve into a social startup, and aims at bringing cost-effective water disinfection tools to remote and isolated communities in developing countries. The reactor that Enrico Chinello (Laboratory of Applied Photonics Devices) and Dr. Mohammad Hashemi (Optics Laboratory) have developed is particularly suitable to be powered with solar panels, thus ensuring a fully stand-alone operation to disinfect water. Our reactors can disinfect more than 120,000 liters of water in 3 hours, starting from only table salt and electricity. DROP alleviates lack of safe water and improves overall hygiene and sanitation conditions. As a result, it can directly address the SDG 6 of UN sustainable development agenda.



DROP has evolved from a prototype to a product, also thanks to the support of EPFL Tech4Impact's Playgrant. We are now looking for resources and partnerships for field testing and further expansions.

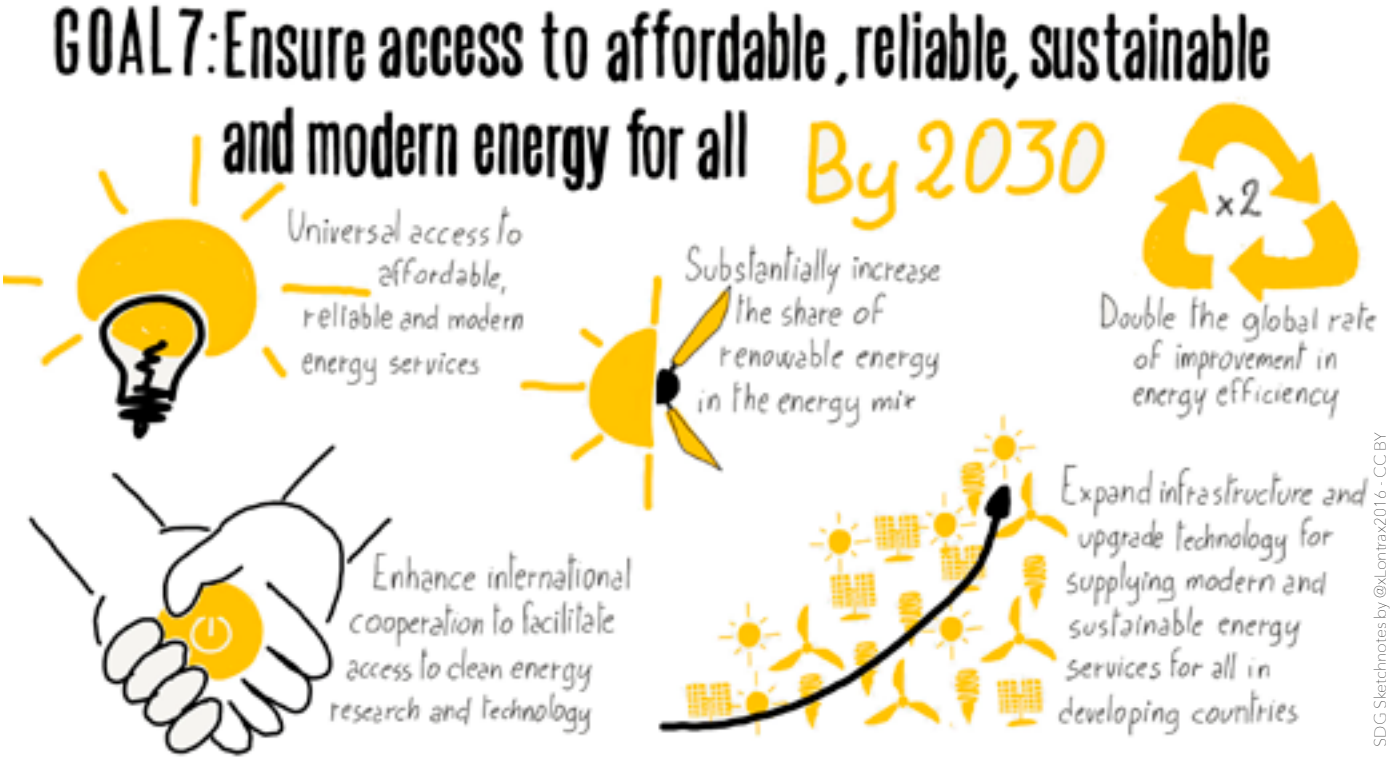
Drop

Contact: Enrico Chinello, Mohammad Hashemi

lapd.epfl.ch

*Further SDGs*

# 7 AFFORDABLE AND CLEAN ENERGY

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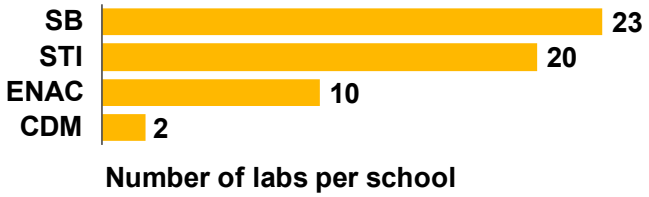
SDG 7 @EPFL

**4 Schools 55 Labs**



# The EPFL Smart Grid Campus Project

Can we develop 100% renewable energy supplied power grids? This poses formidable challenges to power grids with respect to their planning and operational strategies.

The goal of the project is to develop and experimentally validate solutions to the above challenges, by inventing innovative methods that combine information and communication technology with new electrical devices. To reach this goal, we explore four complementary directions: monitoring, control, electric devices and cyber-security.

The smart grid campus project allowed making available at the EPFL a living laboratory to study and evaluate replicable approaches to plan and control future power grids supplied by large amount of volatile energy resources. For example, we are building an innovative monitoring infrastructure on the EPFL campus grid. EPFL is the first in the world to deploy such a system. It comprises a reliable, autonomous communication network and tailor-made real-time control software. Furthermore, we have developed a system for managing and storing energy, which has been inaugurated on the school's campus. It is now connected to the Romande Energie-EPFL solar park and will be used to conduct real-world tests on the behavior of a power grid that is fed electricity from solar panels.


Chair of Distributed Electrical Systems
Contact: Prof. Dr. Mario Paolone
https://desl-pwrs.epfl.ch

# Perovskite Solar Cells

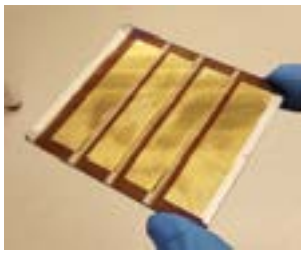
Organic lead-halide perovskite solar cells have shown power conversion efficiencies (PCEs) more than 23%, comparable to silicon solar cells. The device fabrication and materials cost are significantly lower compared to silicon solar cells. Despite this leading role of PSCs in the photovoltaic studies, their long-term stability under repeated operations is the main drawback to overcome for practical application and industrialization.

The Group for Molecular Engineering of Functional Materials (GMF) is developing novel materials involving compositionally engineered perovskites, and interface engineering by producing layer-by-layer deposition protocols of 2-Dimensional/3-Dimensional perovskites heterostructures for long-term stability and reliability of perovskite solar cells.

Our research aims at developing stable and highly efficient perovskite materials and interfaces for solution processable single-junction solar cells with 25% efficiency: a "game-changer" for the society's future renewable energy needs. The discoveries of our group have the potential to address to SDG goals of 6, 7 and 8.

The demonstration of stable perovskite photovoltaic devices is promising for the development of next-generation solar cells, which provides universal access to efficient, unlimited, and environmentally friendly energy production. The success of our project will create an enormous global impact on energy, economy, and environment.

Perovskite structure



GMF director Prof. Mohammad Khaja Nazeeruddin

GMF Senior Scientist Dr. Roldán Carmona Cristina

Group for Molecular Engineering of Functional Materials (GMF)
Contact: Prof. Dr. Mohammad Khaja Nazeeruddin
https://gmf.epfl.ch/

*Further SDGs*

# 8 DECENT WORK AND ECONOMIC GROWTH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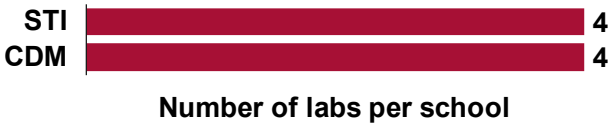
**SDG 8**
**@EPFL**

**2 Schools 8 Labs**



# Yunus Social Business Centre (YSBC) at EPFL

How can we create business that promote sustained, inclusive and sustainable economic growth that benefits society? One promising avenue are businesses that put societal impact at the heart of their economic activities, a concept proposed by the Nobel Peace Prize Laureate Muhammad Yunus.

The Yunus Social Business Centre (YSBC) is the epicenter of social business creation at EPFL. As the first Yunus Centre in Centre in Switzerland, EPFL has become the Swiss Hub for Social Business. At EPFL, one of YSBC's main focus is to explore the link between social business and sport – not least because of Lausanne's strategic and geographic position, which is also home to the International Olympic Committee (IOC).

The YSBC activities support students at EPFL to become social business leaders of tomorrow. In this respect, 7 EPFL engineering students participated in the Yunus Summer School in Dhaka, Bangladesh to acquire the skills neded for starting a social business. Moreover, the YSBC is currently supporting the first EPFL student led hackathon where students from all over the world (from Japan to Brazil) will come together at EPFL to design the future Sustainable Olympic Village of tomorrow.

The YSBC activities will continue to explore potential synergies at the intersections between social business and technology in close collaboration with other key stakeholders in the EPFL ecosystem such as researchers and start-ups.


Yunus Social Business Center at EPFL Tech4Impact
Contact: Beatrice Scarioni
https://t4i.epfl.ch/

*Further SDGs*

# EPFL Innovation Park

The EPFL Innovation Park (EIP) is a major technology hub in Switzerland with over 2,200 innovators & entrepreneurs from 170 high tech start-ups and SME's, as well as 28 innovation units of large companies.

The EIP offers a complete array of professional services, including flexible hosting, training, coaching, acceleration programs, business networking and support in fundraising. It aims to accelerate the science to market process and the growth of start-up companies, thereby paving the way for their economic success.

The EIP's mission is to develop entrepreneurship, primarily amongst young graduates and scientists, and to help high tech startups and SME's grow while innovating in close cooperation with EPFL laboratories. On average, when startups and SME's leave the Park after 5 years they have created 10 times more jobs than when they have joined the Park, translating into hundreds of high expertise jobs created. The EIP also delivers social entrepreneurship training and supports many start-ups operating in the areas of the SDGs developing solutions for critical sustainable development issues.

Thanks to its large portfolio of hosting solutions and professional services, the EIP contributes to the acceleration of science to market, helps scientists become entrepreneurs and facilitates the creation of high value-added jobs by supporting the creation and growth of high-tech start-ups for the benefit of the SDGs.

EPFL Innovation Park
Contact: Jean-Philippe Lallement
https://epfl-innovationpark.ch/

*Further SDGs*

# Necessity Entrepreneurship to Address Unemployment

Unemployment and labor market inequalities are typically associated with developing nations, yet it is also a common phenomenon in many Western economies. To promote inclusive economic growth thus requires an understanding of the factors that enable individuals (especially young people) to transition from unemployment to self-employment.

The Chair of Entrepreneurship and Technology Commercialization, led by Prof. Gruber, seeks to better understand how individuals in unfavorable circumstances identify opportunities and exploit them successfully. Based on multiple international studies, the research unpacks how differences in public programs, individual characteristics, and labor market conditions affect the successful engagement of unemployed individuals in new venture creation.

The findings of these studies inform SDG 8, which seeks to promote inclusive economic growth. The studies provide important insights into factors that enable individuals to use their creative and innovative capabilities for the creation of entrepreneurial ventures, thereby contributing to the creation of jobs and the promotion of local economies.

The initial studies have been conducted in Western economies, in a next step there is a need to broaden the scope to explore the observed entrepreneurial dynamics in developing country contexts (SDG 1).

Chair of Entrepreneurship and Technology Commercialization
Contact: Prof. Dr. Marc Gruber
https://entc.epfl.ch/

*Further SDGs*

# 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

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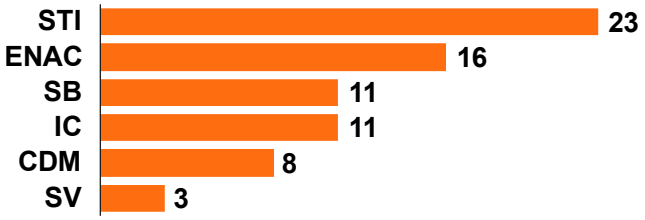
SDG 9 @EPFL

**6 Schools 72 Labs**




Number of labs per school

Limestone Calcined Clay (LC3) Project

# Low Carbon Cement

Cement is the most produced material in the world with 4.200 million tons of production per year. The demand is expected to increase to 5.000 million tons in 2050. At the same time, cement is responsible for 5 - 10% of human-made CO2-emissions and it requires a high extent of resources.

Utilization of LC3-cement

A joint research team from EPFL Switzerland, IIT Delhi and Madras, TARA India and the Cuban institute CIDEM has developed and tested an innovative cement, which is called **Limestone Calcined Clay Cement, or LC3** for short. This new cement reduces the CO2-intensive clinker content to 50% and replaces it with widely available and often waste or second grade materials which are limestone and calcined clay. In result, 30% of CO2-emissions can be saved. Furthermore, production cost can be up to 25% lower, resource-efficiency is increased and technical advantages regarding durability and strength are achieved.

LC3 greatly contributes to the SDG 9. It is a solution for sustainable development and climate protection at the same time. By being financially, technically and environmentally superior to conventional cement, LC3 is a perfect example for a feasible innovation which can transform an established industry in order to make it more sustainable.

In the first years of the project, the technical feasibility of LC3 was proven. Afterwards, the environmental and economic attractiveness was verified. Since 2017, the project focuses on the market implementation of LC3 in different strategic regions. These are typically growing economies with a large demand for building materials. The implementation efforts require industrial and political engagement as well as academic knowledge transfer.

House made 98% out of LC3 - saved 15.5 tons of CO2, equivalent to 13 passengers travelling from Geneva to Delhi by plane, and used 26.6 tons of industrial waste.

Laboratory of Construction Materials
Contact: Prof Karen Scrivener
https://lmc.epfl.ch

*Further SDGs*

# Transportation Center TRACE

The Transportation Center is an EPFL strategic research center launched in 2010. TRACE's first mission is to be the interface between EPFL and the outside world for all matters related to transportation, of both people and goods.

TRACE activities are of three kinds: to initiate transportation-related research projects in collaboration with private and public partners; to build strong partnerships with key players in the transportation sector; to raise external funding to support the development and the expansion of transportation research at EPFL. Since 2010, TRACE has raised in total more than CHF 26 millions for and initiated about 150 research projects.

Several projects related to TRACE activities are complying with the SDGs. It is worth mentioning one that aims at developing a novel rail-pad system optimized with respect to both noise reduction and protection of the railway superstructure against vibrations. Others examples are related to engine waste heat recovery, energy saving in transportation or autonomous driving technologies and acceptance.

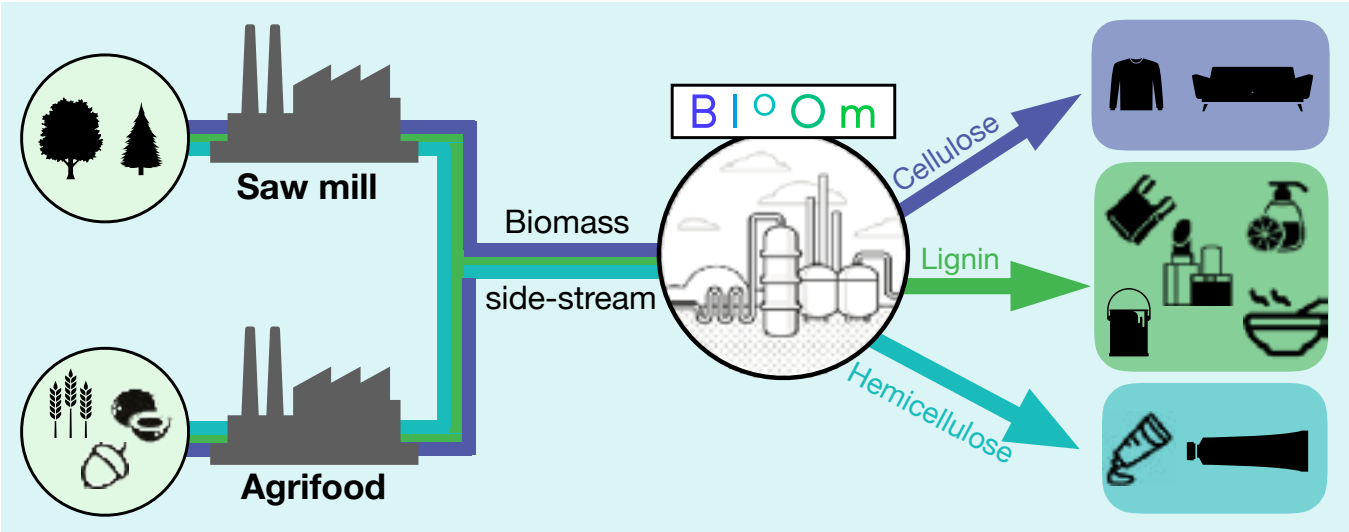
TRACE plays a key role in facilitating the collaboration between the private and public partners in one hand and EPFL scientists on the other hand in the field of transportation. The Center uses his position to foster an innovation compliant with SDG in industry and public partners.


TRACE
Contact: Michel Bierlaire
https://transport.epfl.ch

*Further SDGs*

# Bloom Biorenewables

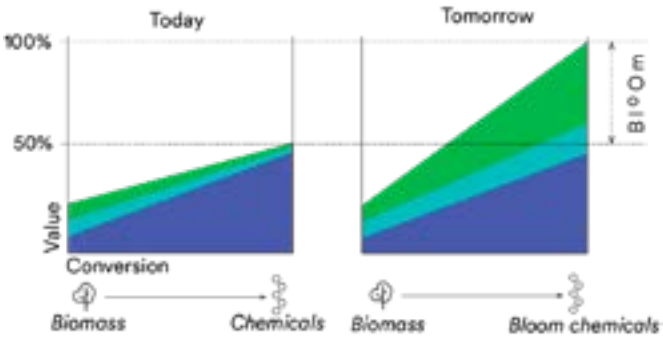
The increasing environmental burden of climate change and resource depletion is compelling society to rethink our largely fossil-based chemical industry. Valorisation of molecules from natural materials, such as wood or plants, has the potential to promote the switch to bio-based feedstocks. However, the lack of cost-competitive solutions has constrained the implementation of plant-based products.




Bloom has developed a ground-breaking solution for the production of sustainable and cost-competitive bio-based materials for the chemical industry. Bloom is the first company able to isolate and selectively break down "lignin", a largely unexploited constituent of plants and the bio-based fraction that most resemble petroleum.

Bloom's innovation contributes to sustainable industrialization (SDG 9) and significantly reduces GHG emissions by switching from fossil fuels to biomass (SDG13) for the production of building blocks and fuels (SDG7). Bloom's circular economy model distributes value along the supply chain (SDG10), contributes to the efficient use of resources and reduces agro-forestry wastes management issues (SGD12).

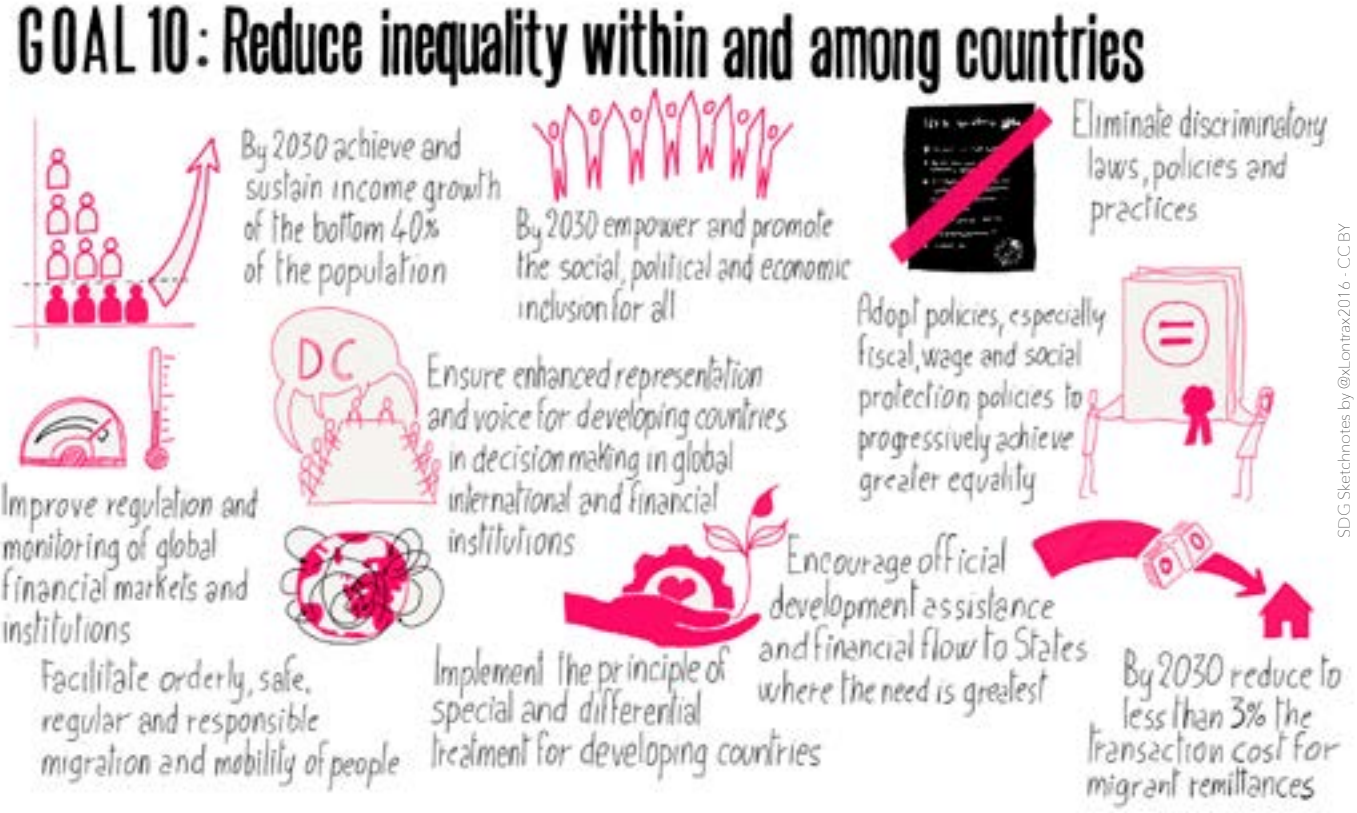
Bloom's unique method has a proven traction from large industrial players and the team is planning the scale-up in Europe to meet their demands.




Bloom Biorenewables
Contact: Remy Buser, Florent Héroguel
http://www.bloombiorenewables.com/

*Further SDGs*

# 10 REDUCED INEQUALITIES



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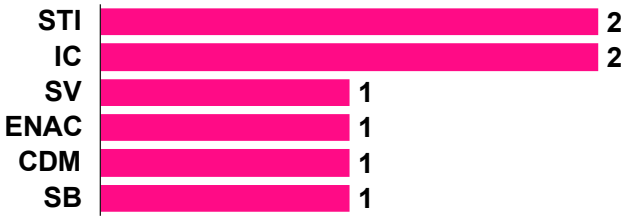
SDG 10 @EPFL

**6 Schools 8 Labs**




**Number of labs per school**

# Why the World Reads Wikipedia: Beyond English Speakers

As one of the Web's primary multilingual knowledge sources, Wikipedia is read by millions of people across the globe every day. Despite this global readership, little is known about why users read Wikipedia's various language editions and how the information needs of users vary across regions and countries. This lack of understanding makes it hard to improve Wikipedia, particularly for audiences in developing countries.

To bridge this gap, we are conducting comparative studies by combining large-scale surveys of Wikipedia readers across 14 language editions with log-based analyses of user activity. In our analyses, we have compared the prevalence of Wikipedia use cases across languages, thus discovering commonalities, but also substantial differences, among Wikipedia languages with respect to their usage. We also show that certain Wikipedia use cases are more common in countries with certain socio-economic characteristics; e.g., in-depth reading of Wikipedia articles is substantially more common in countries with a low Human Development Index. Equipped with this knowledge, Wikipedia editors and administrators are in a better position to cater to readers across locales.

This project is in line with SDG 4 and SDG 10. By understanding and improving Wikipedia, the world's most popular encyclopedia, it helps ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

The findings from this project advance our understanding of reader motivations and behaviors across Wikipedia languages and have implications for Wikipedia editors and developers of Wikipedia and other Web technologies. This research is helping Wikipedia further increase its reach across the globe, improve its content to cater to more diverse audiences, and ultimately increase global knowledge equity.

Data Science Lab
Contact: Prof. Robert West
https://dlab.epfl.ch/

*Further SDGs*

# MOOCs4Development

Since 2013 MOOCs4Africa addresses the main challenges of higher education in African countries by investing in the creation of high-quality and up-to-date digital contents that are of relevance to local economies' needs. MOOCs4Development privileges the supply of MOOCs and OER for STEM education and ICT training.

MOOCs4Development enabling female students training in STEM disciplines

Through a continuous capacity building, MOOCs-4Development enables its African academic partners to take ownership of competencies and technologies required to the creation and usage digital educational content. MOOCs4Development enables equal access for women and men to high-quality tertiary education. Its focus on STEM disciplines contributes to increasing the number of youth and adults acquiring relevant skills that aim to foster sustainable development to the benefit of their local economies (SGD 4.3, 4.4, 4.6, 4.7)
The creation of centres of techno-pedagogical competences in African countries accompanied by EPFL continuous capacity development of African teachers enhances the transfer of competencies and ownership to our local academic partners (SDG 4.A, 4.B). MOOCs4Development promotes access of relevant and high-quality digital education to all, and calls for dedicated financial investment to fulfilling this purpose. The programme operates in ten African target countries, six of which are LDCs and/or LLDCs (SDG 10.2 /10.B)

MOOCs4Development has been successful in implementing its strategy. To date, in partnership with 19 partner universities and development agencies, three new centres of competence are operated/managed, and over 150 African teachers have been trained.

Recording of a MOOC at INP-HB, Yamoussoukro, Cote d'Ivoire. Studio build and operated with the help of MOOCs4Development.

MOOCs4Development
Contact: Dimitrios Noukakis
https://moocs-afrique.epfl.ch/

*Further SDGs*

# Ingénieurs du Monde

Active on the EPFL campus for more than 30 years, Ingénieurs du Monde is a student association promoting scientific collaboration for a poverty- and inequality-free world. The Sustainable Development Goals (SDGs) offer us a great framework to reach this ambition.

Ingénieurs du Monde raises awareness among students about the global challenges that the world is currently facing. We act on two levels: First (1) we offer travel grants to EPFL students going in Low- and Middle-Income Countries (LMICs) to do an internship that contributes to the SDGs. Secondly (2), we organise events on the campus and publish articles about development in our magazine "Le Point Sud".

As a platform, we act as an interface between EPFL students and our partners around the world. Global partnership for sustainable development (SDG 17) is therefore in the heart of our association. Our other activities on the campus mainly focus on the Goal 1 - No Poverty and Goal 10 - Reduced Inequalities.

Romain B., student in Environmental Sciences and Engineering, did his master thesis in Palestine, with financial support of Ingénieurs du Monde. His project was about assessing efficiency of water filters in homes.

The president of the association, Niroshan V., introduces Ingénieurs du Monde before the screening of the documentary "Anote's Ark" in Rolex Auditorium.


The "Semaine du Monde" is the biggest event of the association. Taking place each year, it offers many diversified events all the week long: conferences, talks, concert, photo exhibitions, food stands...

Throughout our internship offers and events on the campus, Ingénieurs du Monde provides opportunities to EPFL students to become responsible engineers for the world of tomorrow.

Ingénieurs du Monde
Contact : Niroshan Vijarasa
http://idm.epfl.ch/

*Further SDGs*

# 11 SUSTAINABLE CITIES AND COMMUNITIES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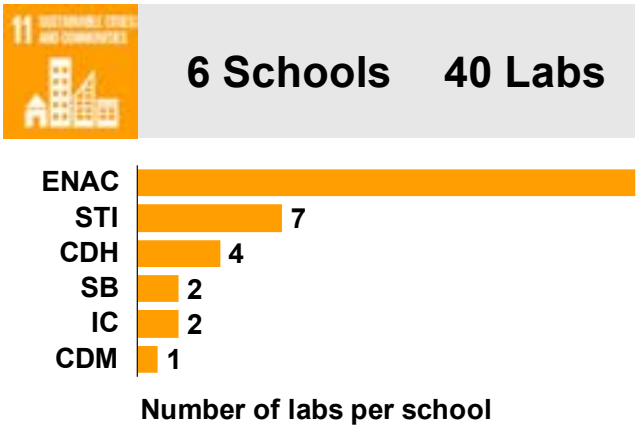
SDG 11 @EPFL



EPFL Sustainability Office:

# Campus Durable

Created twelve years ago, the EPFL Sustainability Office (Campus durable) is reporting to the Vice-Presidency for Human Resources and Operations (VPRHO). We intend to capitalize and extend the sustainability actions on the campus with a reinforced action plan for 2018-2020. It is directly related to the ambitious environmental and climatic goals of EPFL, the Federal administration and the CEPF.

Rebox: In order to limit waste production related to take-away food sales, most food trucks and restaurants will now offer reusable lunchboxes, fitted with an airtight lid

The new EPFL Bike Repair Center, carried out on the basis of the student winning project of the Sustainable is beautiful competition organized by LAST

The EPFL Sustainability office has so far developed its activity mainly in the field of operations (energy, mobility, biodiversity, food, waste, purchasing). The launch of the first Act for Change initiative in 2015 (5 editions since) made it possible to further broaden the reach through a wide participation and interaction of the campus community, with the objective of setting up a real living laboratory on sustainability.

The Sustainability office mainly addresses its actions in relation to SDG 11 (Sustainable Cities and Communities), but many links can be established with other SGS's. like:

3: Good Health and Well-Being (Campus-santé, Food)
4. Quality eduction (Durabilis Award, Semaine ENAC, follow-up of student work)
6: Avoiding wasting water (monitoring)
7: Affordable and clean energy (Heat Powerplant, Solar Park)
13: Climate action (Act for change, Act for change Lab, Semaine durable)
15. Life on land (Campus BIO, biodiversity)

Largest urban Solar Park in Switzerland on the roof of EPFL (2.2 MW)

The Sustainability Office intends to develop a sustainability governance platform through all EPFL missions (education, research, innovation, opration), based on the SDG's criteria and establish consistent actions and monitoring on this basis. A real living laboratory for sustainability.

Campus Durable
Contact: Philippe Vollichard
https://developpement-durable.epfl.ch/

*Further SDGs*

# The smart living lab

The smart living lab is a cutting-edge, inter-institutional and interdisciplinary research platform devoted to the built environment of the future. The smart living lab places the human and human well-being at the center of its considerations, at the same level as environmental and energy issues, exploring the different opportunities for a digital transformation. The smart living lab develops its activities in full-scale experimentation.

The smart living lab, located on the blueFACTORY site in Fribourg since late 2015, brings together the combined expertise of EPFL, University of Applied Sciences HEIA-FR, and the University of Fribourg in research areas such as construction technologies (SDG 9,12), energy systems (SDG 7,13), well-being and behaviors (SDG 3,11), as well as interactions and design processes (SDG 8,9,11). As an exemplar project, the NeighborHub - winning entry for the U.S. Solar Decathlon 2017 competition now rebuilt on the blueFactory site – aims to raise awareness on one's role in reaching environmental goals by acting on seven driving themes: renewable energy, soft mobility, biodiversity preservation, choice of materials, local food, water and waste management, thus addressing SDGs 4, 6, 7, 9, 11, 12, 13, 15.

The goal of the smart living lab is to provide a unique platform for the emergence of research and innovation on the most urgent and exciting questions pertaining to the future of the built environment.

The smart living lab
Contact: Martin Gonzenbach
https://www.smartlivinglab.ch

*Further SDGs*

# Sustainability Assessment of Urban Systems

The share of global population living in cities is increasing rapidly. Even though cities only cover 3% of Earth's surface, they account for 75% of total CO2 emissions and 80% of global GDP. This highlights the central role of cities in the global sustainability challenge. But what does a transition towards sustainable urban systems require? How to maximize the positive impacts of cities while minimizing the negative ones?

The interdisciplinary chair for Human Environment Relations in Urban Systems (HERUS), led by Prof. Binder, seeks to understand how transitions towards sustainable urban systems could be supported. In particular, HERUS develops concepts and tools that address three types of knowledge (systemic, goal and transformational) that are required for assessing and steering urban systems towards a more sustainable state.

The focus and findings of our research supports directly the realization of SDG11, which seeks to ensure the sustainable and livability of future cities and communities. Our studies provide various tools for assessing the strengths and weaknesses of cities and communities regarding sustainability, and for uncovering their possible paths towards sustainability.

A key to urban sustainability is to develop cities that are livable and desirable for different cultural and socio-economic groups. Therefore, in the future we will combine our data driven approaches with crowd sourcing approaches to address the subjective aspects of sustainable cities.

Chair for Human Environment Relations in Urban Systems
Contact: Prof. Claudia Binder
https://herus.epfl.ch/

*Further SDGs*

# Toward an Innovative Mobility for Teenagers in Europe

This study aims at defining future mobility of under 18 years old students in Europe and at assessing the relevance of a mini-EV for this population.

The development of information and communication technologies participates in a new relation with space and time. In this context, the mobility of people under 18 has largely evolved since the middle of 2000s. Their autonomy, their participation to diverse activities, their sociability could motivate today a larger and freer mobility. Spaces where they use to go, hours when they travel, transport conditions they want, images they have on transport modes, etc. have to be better understood to help working on a new mobility offer for young people in Europe.

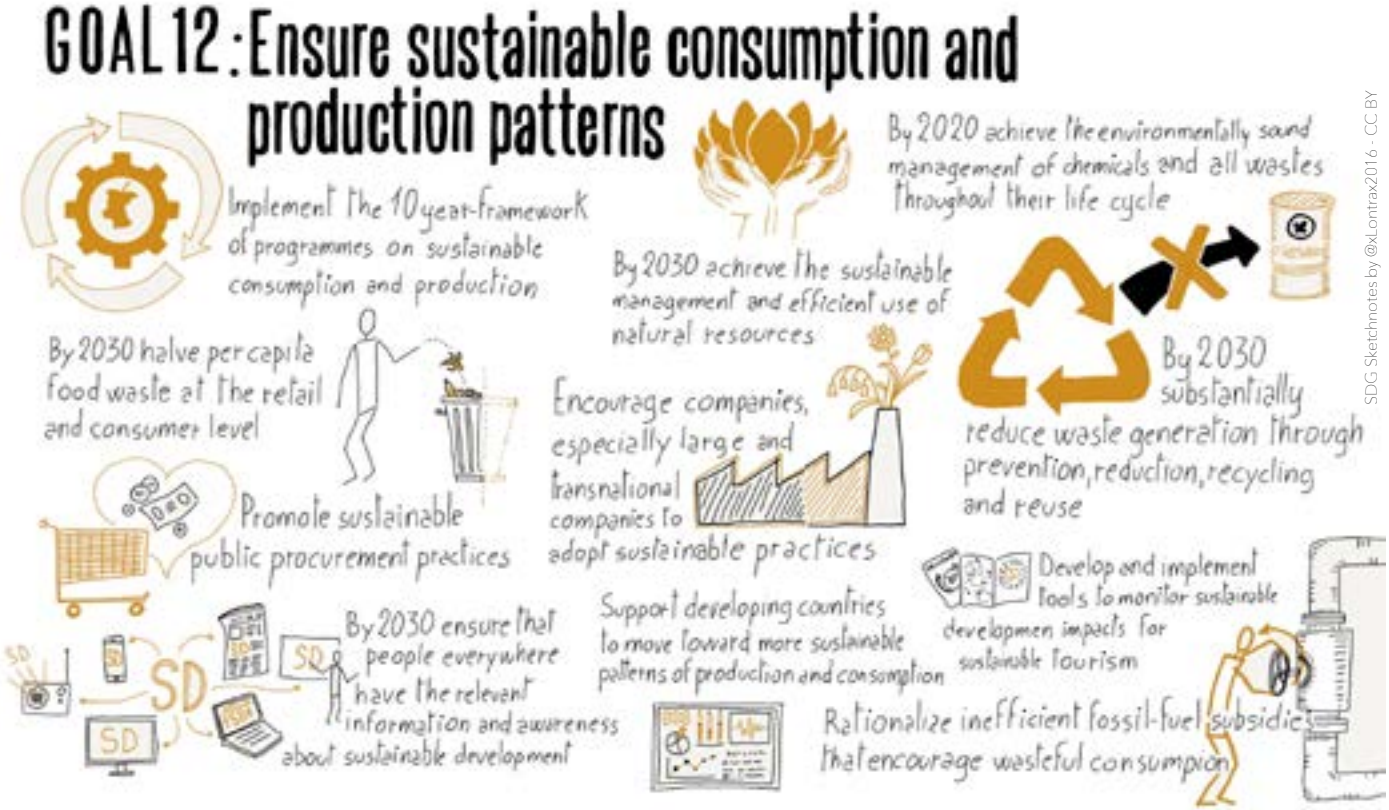
This study aims at defining future mobility of under 18 years old students in Europe and at assessing the relevance of a mini-EV for this population. The research program include:

- an overview of mobility services in Europe for people under 18,
- a better understanding of mobility practices and aspirations of people under 18 in Europe,
- the European context on the legal point of view,
- a definition of under 18's acceptance for mini-EV in Grenoble (France)
- a discussion on possible mini-EV production processes

The project lasts 6 months and is conducted by the Laboratory of Urban Sociology, directed by professor Vincent Kaufmann, in collaboration with the Social Media Lab and the Laboratory for Microengineering for Manufacturing. It is sponsored by Toyota.

Urban Sociology Laboratory
Contact: Prof. Vincent Kaufmann
https://lasur.epfl.ch/

# 12 RESPONSIBLE CONSUMPTION AND PRODUCTION



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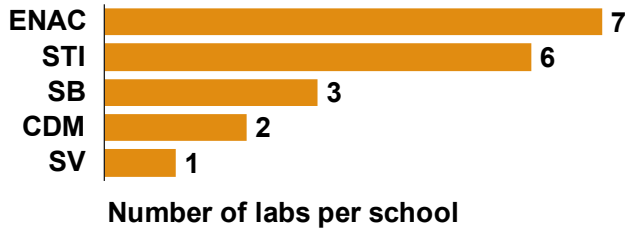
SDG 12 @EPFL

**5 Schools 19 Labs**



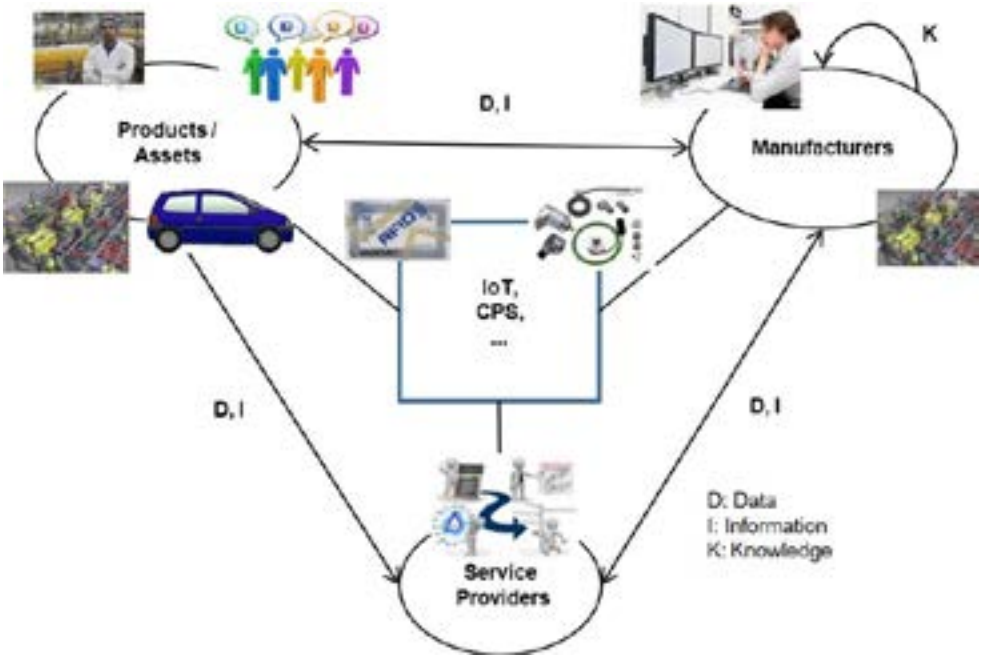
# Big Industrial Data for Zero Defect Manufacturing

Modern production requirements call for more efficient, productive and eco-friendly planning and scheduling. Zero Defect Manufacturing (ZDM) is an approach to satisfy this need. The goal of ZDM is to eliminate defected parts and therefore achieving higher efficiency, eco-friendliness and lower production costs. Four Data Driven ZDM strategies are applied and interconnected with each other: detection, repair, prediction and prevention.

Our ICT for Sustainable Manufacturing group, through our collaborative H2020 and InnoSwiss projects contributes to demonstrate, in a realistic, measurable, and replicable way an open, certifiable and highly standardised, SME friendly and transformative shared semantics-based, data-driven product-and-service model for Factory 4.0 Predictive Maintenance and Zero Defect Manufacturing solutions.

Data-driven predictive maintenance and ZDM strategies and technologies are contributing to achieve optimal results towards minimum resource and energy consumption, and zero waste – zero emission production. This goal requires global collaboration to contribute towards realizing SDGs 9, 11, 12 and 17, particularly for sustainable industrial practices and associated production and consumption paradigms.

In the coming years, "Data-Driven Closed-Loop Lifecycle Management for Sustainable Production and Consumption of Complex Products", i.e. the use of embedded information devices will be extended from the current use to a wide variety of other applications covering the whole lifecycle of products and services.




ICT for Sustainable Manufacturing Group
Contact: Prof. Dimtris Kyritsis
https://ict4sm.epfl.ch/

*Further SDGs*

# RePlaSte

## Reforming Plastic Waste for a Sustainable Future

Remaining one of the most flagrant hazards yet to be managed, abandoned plastic causes extensive environmental damage almost everywhere in the world by people's insufficient recycling habits, weak governmental policies and scarce business initiatives. To alleviate this tremendous problem, non-recyclable plastic wastes should be valorized in various socio-economic aspects through the development of respective technologies.

Against this background, RePlaSte aims to use a solar-driven reforming of plastic wastes into fuel following a plastic-to-power research initiative which is actively launching mainly in the US, China and Europe. The process is based on valorization of the chemical energy stored in a hydrocarbon skeleton of organic polymers by exposing them to sunlight in the presence of the right photocatalyst which can enable the redox chemical transformation.

Being focused on the conversion of waste materials into fuels, this project represents an attractive approach to simultaneously address two global challenges: plastic waste alleviation (SDG 12 - Responsible consumption and production) and renewable fuel production (SDG 7 - Affordable and clean energy), both impacting on SDG 13 - Climate action.

To reach our goals, we propose several porous composites of a high potential for photoreforming of waste materials. We envision that our catalysts can overperform existing alternatives in waste-to-power conversion efficiencies as well as to manifest a selectivity towards desirable products depending on the tunable nature of the metal active site.

Laboratory for Functional Inorganic Materials
Contact: Prof. Wendy Lee Queen
https://lfim.epfl.ch/

*Further SDGs*

# Integrative Food & Nutrition Centre

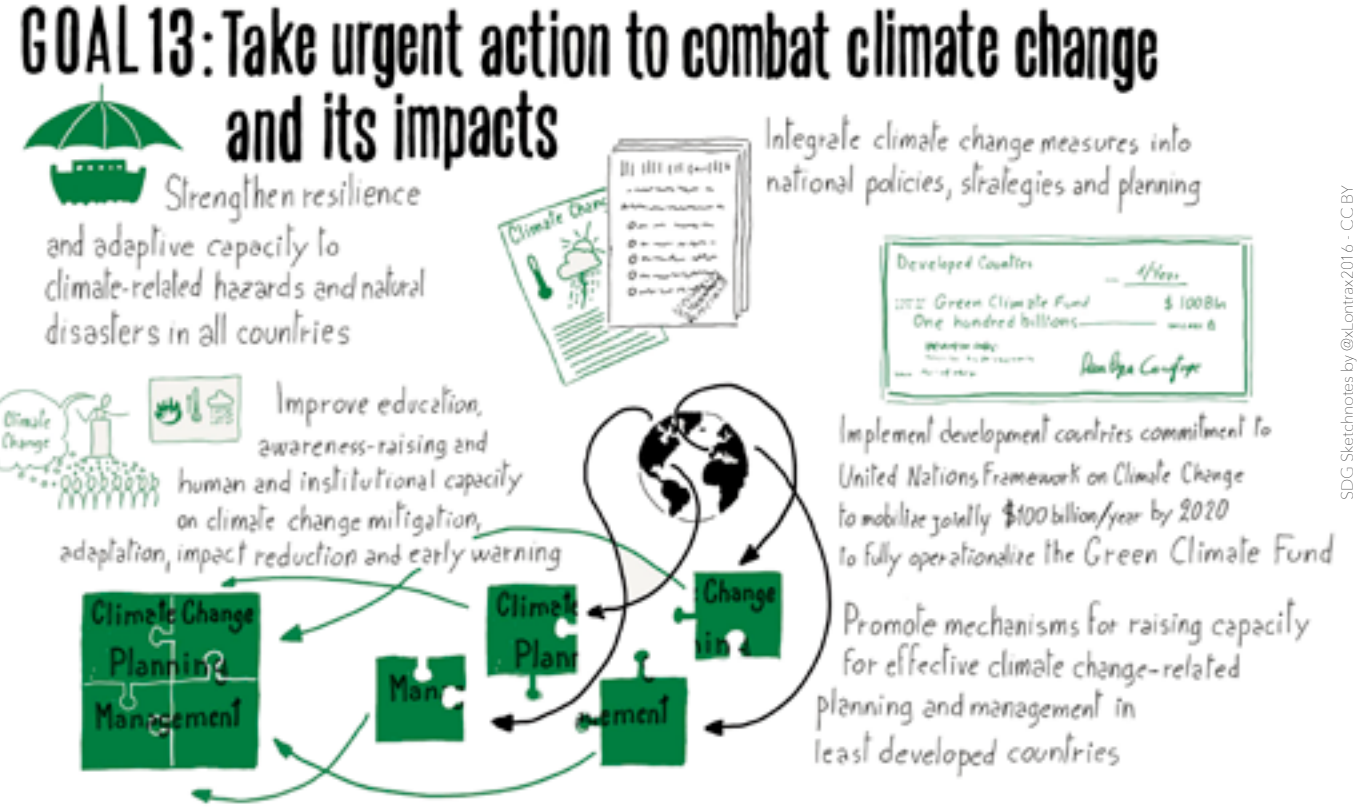
Feeding the world's population is the next great challenge of the 21st century. Each year more than one billion tons of food is lost or wasted in the world, while hundreds of millions of people are undernourished. Moreover, with population growth, current modes of food production soon will no longer be able to support the global population. Food quality is also at the heart of issues related to health. Economic, political as well as technological factors all come into play.

In order to contribute to the search for innovative solutions in this domain, EPFL launched an interdisciplinary center called the Integrative Food and Nutrition Center (IFNC). The mission of the IFNC is to act as interface between EPFL and the outside business actors and foster the transfer of relevant science and technologies to help the industry address the major societal and environmental challenges associated to food & nutrition. To this effect, the IFNC is spanning various domains from fundamental research to Health Sciences, from IT to Management. One critical pilar of the IFNC activity is to foster the development of start-ups and entrepreneurs, and by extension of the entire innovation ecosystem around food & nutrition.

Integrative Food & Nutrition Centre
Contact: Christian Schwab
https://nutritioncenter.epfl.ch

*Further SDGs*

# 13 CLIMATE ACTION



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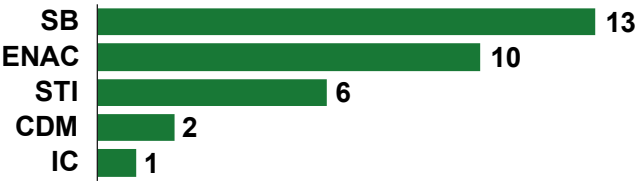
SDG 13 @EPFL

**4 Schools 32 Labs**




Number of labs per school

# Swiss Polar Institute (SPI)

Leg 1, January 2017: The Akademik Treshnikov on her way to Hobart, Australia. (https://spi-ace-expedition.ch/pictures/)

SPI was founded by the EPFL, ETHZ, WSL, University of Berne and Editions Paulsen in order to bring new synergies and opportunities for scientific work in polar regions and extreme environments for researchers working in Switzerland. SPI is hosted at the EPFL but is at the service of the entire Swiss academic community interested and working in such regions.

SPI supports scientists working in polar regions and extreme environments by providing complementary funding focusing on young scientists and field work. In particular, SPI organises large research expeditions in polar regions, such as the upcoming Greenland Circumnavigation Expedition – GLACE (2019). SPI also provides access to research infrastructure, international research initiatives, training for safety in the field and organises conferences, networking events and scientific workshops. Dedicated events for a wider public, including partnerships with schools are also part of its portfolio.

Through polar amplification effects but also as a global economy and mountain country, Switzerland has a long tradition of scientific work in extreme environments. Switzerland has a very varied polar science community and well-regarded ranging from oceanography, climatology, atmospheric sciences to data sciences, glaciology or tech development.

Leg 3, March 2017: ACE zodiacs landing among king penguins at St-Andrews Bay, South Georgia island.

Leg 2, February 2017: Ice coring on the Mertz glacier

Swiss Polar Institute
Contact: Danièle Rod
www.swisspolar.ch

*Further SDGs*

# Ecological Systems Laboratory:
## Interactions Between Ecosystem Functioning and Climate Change

Climate change and its effects on our ecosystems is probably the greatest environmental threat of the 21st century. Climate change, ecosystem functioning and ecosystem management and restoration are interrelated.
Understanding the complex relationship between these three research areas is the basis for evidence-based action and policy-making each in of the three domains.

The scientific focus of the ECOS lab is on the organization, functioning and dynamics of terrestrial plant, animal and microbial communities, in relation to ecological processes.
A strong focus is the functional links between above- (vegetation) and below ground (soil) biological communities in the delivery of critical ecosystem services and as indicators of a changing environment (land-use and climate change).
To study these complex interactions, we propose an integrative approach using methods in community ecology and soil biogeochemistry, with both experimental and modelling methods.
The model ecosystems we study are mountain pastures, wooded pastures and wetlands (bogs, fens and floodplains).

Addressing climate change (SDG 13) requires understanding the consequences of climate change on terrestrial ecosystems (SDG 15) and the consequences of modifications of terrestrial ecosystems on land-use and potentially on the climate (SDG 13). Research at ECOS provides evidence-based insights into these complex relationships.

In a context of climate change, adaptive management of ecosystem is becoming important to sustain ecological goods and services and livelihood.

Ecological Systems Laboratory
Contact: Prof. Alexandre Buttler
https://www.epfl.ch/labs/ecos/

*Further SDGs*

# Vanishing Glaciers

## What else besides water is lost?

Mountain glaciers are disappearing before our eyes because of climate change. As these glaciers shrink, the streams that they feed are changing and ultimately disappearing as well. The microbial life flourishing in these extreme stream environments remains unknown to date. The research supported by the Nomis Foundation aims at deciphering the evolution and secrets of the success of the microbiome in glacier-fed stream. The project will also predict how the biogeochemistry as mediated by the microbiome will change in glacier-fed streams as glaciers further shrink.

To address this pertinent question, the Stream Biofilms and Ecosystem Research Laboratory, directed by Prof. Tom Battin, conducts expeditions to the major mountain ranges worldwide to study the structure and function of function of microbiome in glacier-fed streams. Massive sequencing of the microbial DNA combined with bioassays will unveil the hidden secrets of the microbial life in these extreme environments.

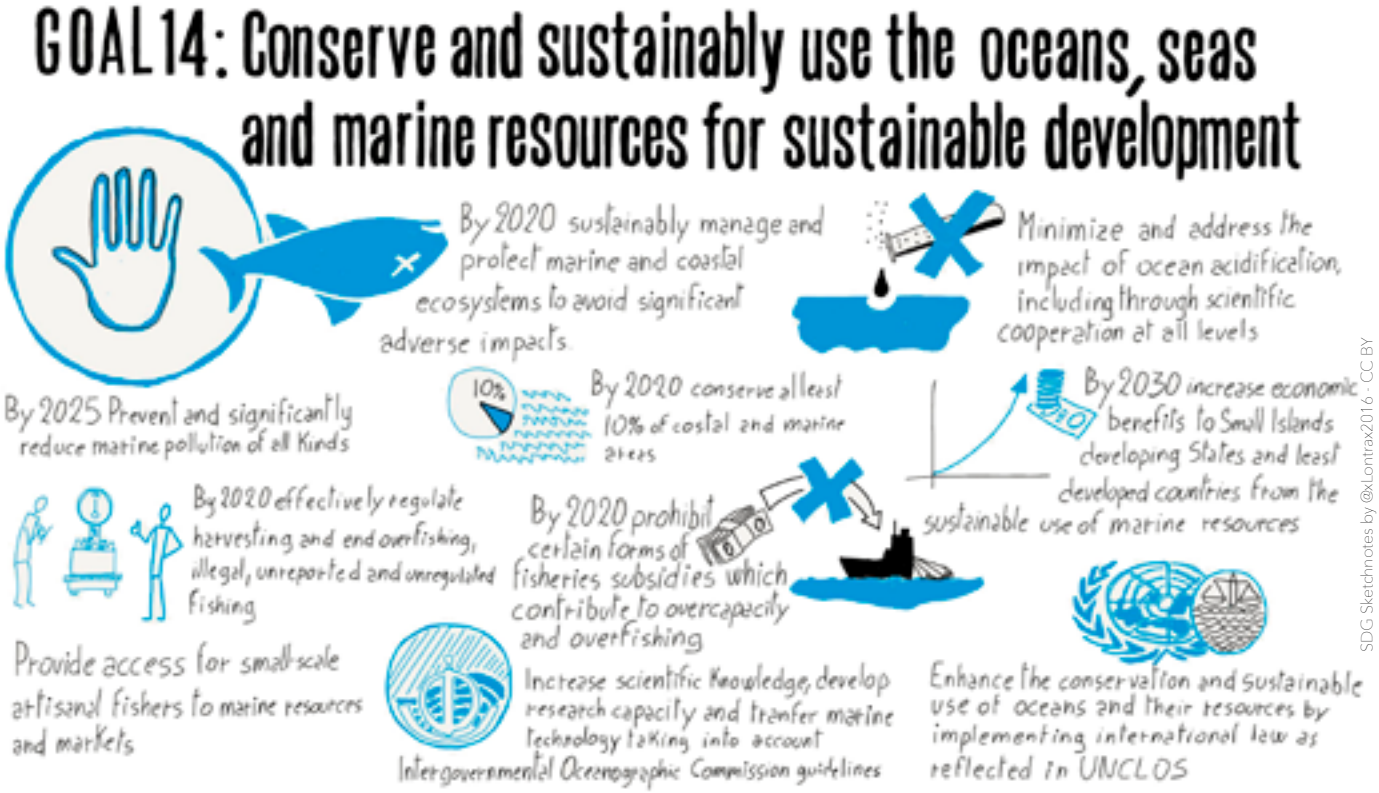
The findings of the research will be a unique contribution to the Climate Change component of SDG13. For the first time, will we be able to draw conclusions on how the functioning of glacier-fed streams may look like in the future as climate change goes on. This is critical to better assess the downstream consequences of this unprecedented environmental change, including biogeochemistry, biodiversity and water resources.

The project has accomplished a first expedition to New Zealand, and shall visit Greenland and the Caucasus this year, initiating a collaborative network around the globe. At the same time, molecular and biogeochemical analyses will start, and findings relevant to SDG13 will be disseminated.

Stream Biofilms and Ecosystem Research Laboratory
Contact: Prof. Tom Battin
https://sber.epfl.ch/

*Further SDGs*

# 14 LIFE BELOW WATER

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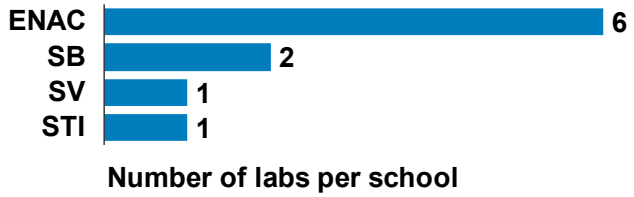
SDG 14
@EPFL

**4 Schools 10 Labs**



# Transnational Red Sea Center

## Science to Protect the Ecosystem


Coral reefs, host to millions of marine species, are under stress and dying from the effects of global climate change and from local stress, such as pollution, overfishing, and physical destruction. This is a very serious problem, not only because of the gigantic loss of biodiversity that results from the decline of corals, but also from an economic perspective: at least 500 million people living in tropical countries are directly depending on the services from healthy coral reefs.

A recent scientific discovery (in part by EPFL researchers) found that in the Northern Red Sea region a highly biodiverse reef exists that is extremely resistant to global temperature increases. Under the current climate change scenarios, this coral reef very likely could be 'the last reefs standing' on a timescale of a hundred years: Indeed, the reef in the Gulf of Aqaba holds the biological secret and is our best hope in the fight to avoid a permanent loss of one of Earths greatest natural treasures.

In direct collaboration with the Swiss Foreign Ministry, EPFL is establishing a Transnational Red Sea Center with a core mission to study and protect the unique Red Sea coral reef ecosystems through a broad, international research effort. This Center will unite scientists from the Middle East region and serve as an example of 'Science for Diplomacy and Diplomacy for Science'. Direct diplomatic and political collaboration at the highest level between the nations that are fortunate to have this reef on their shores must be brokered in order to ensure effective environmental policies, laws, and monitoring to protect the reef. This is achievable with the diplomatic assistance of countries like Switzerland.

Transnational Red Sea Center
Contact: Anders Meibom
http://lgb.epfl.ch

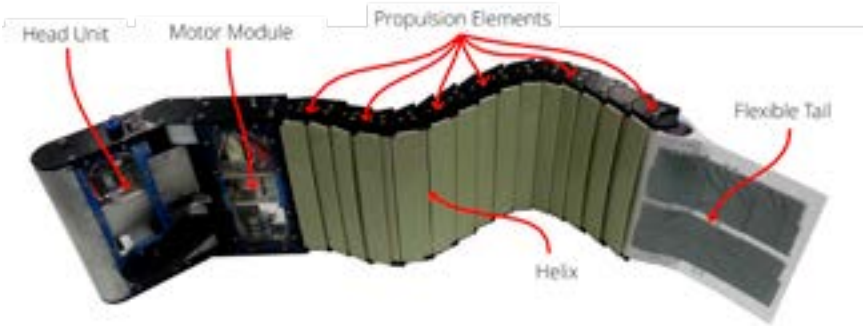
*Further SDGs*

# MIRobotics

## Bionic Sensing for Sustainable Aquaculture

Aquaculture is the fastest growing food production sector: The World Resources Institute estimates the need for a more than doubled aquaculture production, amounting to 140 million tons, to compensate for the predicted global food deficit. Aquaculture's immense growth brings along a set of new needs spanning from environmental monitoring to fish and farm inspection. Traditionally, farmers assess and react to abnormalities in their ecosystem two to three days after the critical event has taken place, as detection of such an event is not possible with state-of-the-art technology. Their data stemming from observed fish behavior is limited, as normal or abnormal tells are clouded from the fish's reaction to human presence. The lack of valuable information leads to greater input use for compensation, in form of increased feed as an easy solution to disturbance resulting in higher cost, waste production and use of questionable chemicals.

MIRobotics bio-inspired mobile sensor carriers offer continuous and non-invasive inspection of aquaculture sites, not just looking from afar, but swimming with the product in the same habitat. We provide solutions for three main needs: Water quality monitoring, infrastructure inspection, and visual inspection of fish. We provide a growing food industry with a tool to minimize and optimize their environmental impact while keeping production numbers, efficiency and product quality high. Additionally, we will provide our innovative technology as service, actively contributing to a local circular economy with strong focus on gender equality. Doing so, we aim to contribute to the achievement of SDG 14 (Life below water), SDG 9 (Industry, Innovation, and Infrastructure), SDG 2 (Zero hunger), and SDG5 (Gender equality).




While impact is probably less visible in short term (within two years) already medium term (3-5 years) results can predict how our sensor-platforms will support the growth of aquaculture in the long term.

MIRobotics
Contact: Behzad Bayat, Peter Eckert
https://mirobotics.ch/

*Further SDGs*

# 15 LIFE ON LAND

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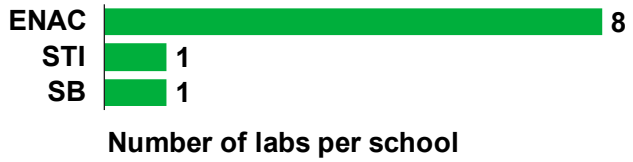
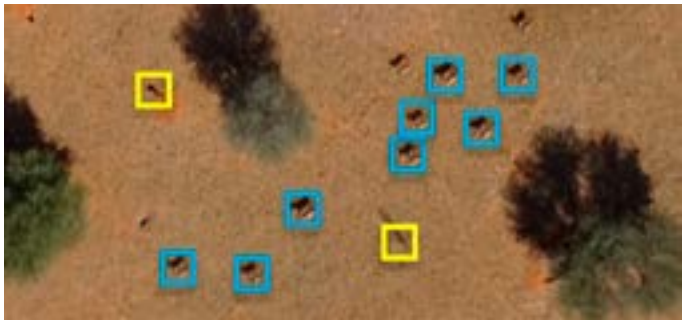
SDG 15 @EPFL

**3 Schools 10 Labs**



# SAVMAP Project

The vegetation of semi-arid savanna landscapes relies on a fragile equilibrium between rainfall, grazing and fires. Farmers need to take into account this delicate equilibrium and adequately balance the number of animals and the food and water resources available each year.



This research project of the Laboratory of Geographic Information Systems (LASIG) at EPFL in collaboration with The Kuzikus Wildlife Reserve and Drone Adventure, two NGOs, aims to favor sustainable land use management and biodiversity conservation in the Namibian semi-arid savanna using ultrahigh-resolution imaging from drones to produce accurate maps. The developed technology uses a semi-automatic system able to detect large mammals, based on machine learning. The algorithm was trained with crowd-sourced annotations provided by volunteers who manually interpreted sub-decimeter resolution color images.

Ensuring the conservation of wildlife and biodiversity starts with monitoring and understanding of current situation in reserves and national parks. This project proposes innovative solutions to protect, restore and promote sustainable use of terrestrial ecosystems (SDG 15).

Technology is an under-utilized asset in the context of wildlife monitoring and protection. SAVMAP is exploring innovative technological approaches to scale the impact of existing reserve and park infrastructures.

Laboratory of Geographic Information Systems (LASIG)
Contact: Dr. Stéphane Joost
lasig.epfl.ch/savmap

*Further SDGs*

# Picterra

EPFL start-up Picterra has devised a smart system that allows users to analyze drone or satellite images of a given territory. Unlike many competitors, the vision of Picterra is to make the exploitation and use of Earth observation imagery accessible to all, not just data scientists and developers, as this is one of the key resources of our century.

Picterra, created in 2016 by Frank de Morsier and Pierrick Poulenas, is an AI-based SaaS platform which allows to interactively create a personalized AI detecting, localizing and counting any objects from satellite and aerial imagery, all in just a few clicks. Above all, Picterra is a community of users who pool their expertise and their vision of the world to collectively create a common library of deep learning models.

With daily images from satellites and the drones being commoditized, the observation of our Earth surface has reached an unprecedented level. Picterra tracks deforestation over thousands of square kilometers of protected forests and anyone can start localizing certain agricultural fields or fallen trees, as well as counting crops or animals on Earth observation images.

Picterra's goal is to democratize the access to Earth observation and machine learning and eventually provide a new source of information to help Humanity make better-informed decisions to protect our global ecosystem.

Picterra
Contact: Frank de Morsier
https://picterra.ch/

*Further SDGs*

# 16 PEACE, JUSTICE AND STRONG INSTITUTIONS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SDG 16 @EPFL

**2 Schools 4 Labs**


**Number of labs per school**

# Center for Digital Trust (C4DT)

For millennia, humans have developed trust-building mechanisms among people, businesses and governments, such as language, contracts and institutions. Today, trust mechanisms need to be transposed to the digital world. In order for the society to benefit from the opportunities offered by digitalization, we need to create a technical, legal and ethical framework that delivers strong guarantees, is universal, and reduces the cost of achieving trust in the digital world.

Digital trust can only be achieved through a collaborative effort from multiple actors (SDG 17). C4DT brings together businesses and institutions, research community, civil society, and policy actors to collaborate, share insights, and to gain early access to trust-building technologies, building on state-of-the art research at EPFL and beyond.

The activities of C4DT are mostly contributing to advancing SDG 16 (16.10). However, low levels of trust in the cyberspace induced by breaches and malicious usage constitute a challenge for multiple SDG targets. They hinder the adoption and deployment of digital technologies, which aim to provide public and trustworthy access to information and to protect fundamental freedoms, such as the right to privacy, in today's digital world.

C4DT facilitates innovation in digital trust services and products in order overcome the challenges to meet some of the SDG targets.

Center for Digital Trust
Contact: Olivier Crochat
https://c4dt.org/

*Further SDGs*

# DLT-based secure e-Voting Systems

Fair and neutral voting institutions are at the basis of democratic societies. Unfortunately, this is not the case for many institutions. Additionally, voting participation tends to be low partly due to inconvenience of the registration process and the inconvenience of physical presence at the voting locals. E-voting may provide a solution to this problem, but requires a safe and easy-to-use platform.

EPFL's Decentralized and Distributed Systems Laboratory (DEDIS), developed an open-source e-voting system, which, when put to the test during EPFL's internal elections, passed with flying colors. The system, underpinned by the blockchain principle of distributed trust, decentralizes the voting and counting processes. These processes are run by several separately managed machines rather than by one central service alone. Data is kept anonymous, and the election outcome is transparent, readily verifiable and guaranteed to be valid.

Looking ahead, this system could prove extremely useful in sensitive elections where suspicions of wrongdoing are rife. Using a distributed system means that the opposing sides, which may not trust each other (e.g. in post-conflict situations), can be sure that the results are valid and can get actively involved in making the voting process secure. This technology could provide a game-changing instrument towards creating strong institutions and ensuring peace (SDG 16).

Distributed ledger technology (DLT), ensuring decentralized trust, is a digital technology holding the promise to transform the way we design and operate institutions. E-voting is just one of many potential use cases for advancing the sustainable development goals.

Decentralized and Distributed Systems Laboratory
Contact: Prof. Bryan Ford
https://dedis.epfl.ch/

# Scholars At Risk (SAR)



The advancement of knowledge, science and technology is crucial for sustainable development. Yet, academic freedom and scientific capital (including human capital) are increasingly at risk due to attacks on scholars, higher education institutions and students, which occur with alarming frequency in all world regions. Also, an unprecedented refugee crisis contributes to record numbers of scholars seeking help today.

Scholars at Risk (SAR) is a global network of higher education institutions whose mission is to promote academic freedom and protect scholars who have been forced to leave their universities and countries because of war and persecution. As member of SAR, EPFL is engaged in:

- Hosting threatened scholars on temporary academic visits
- Speaking out against attacks on higher education communities
- Empowering scholars and students to promote academic freedom

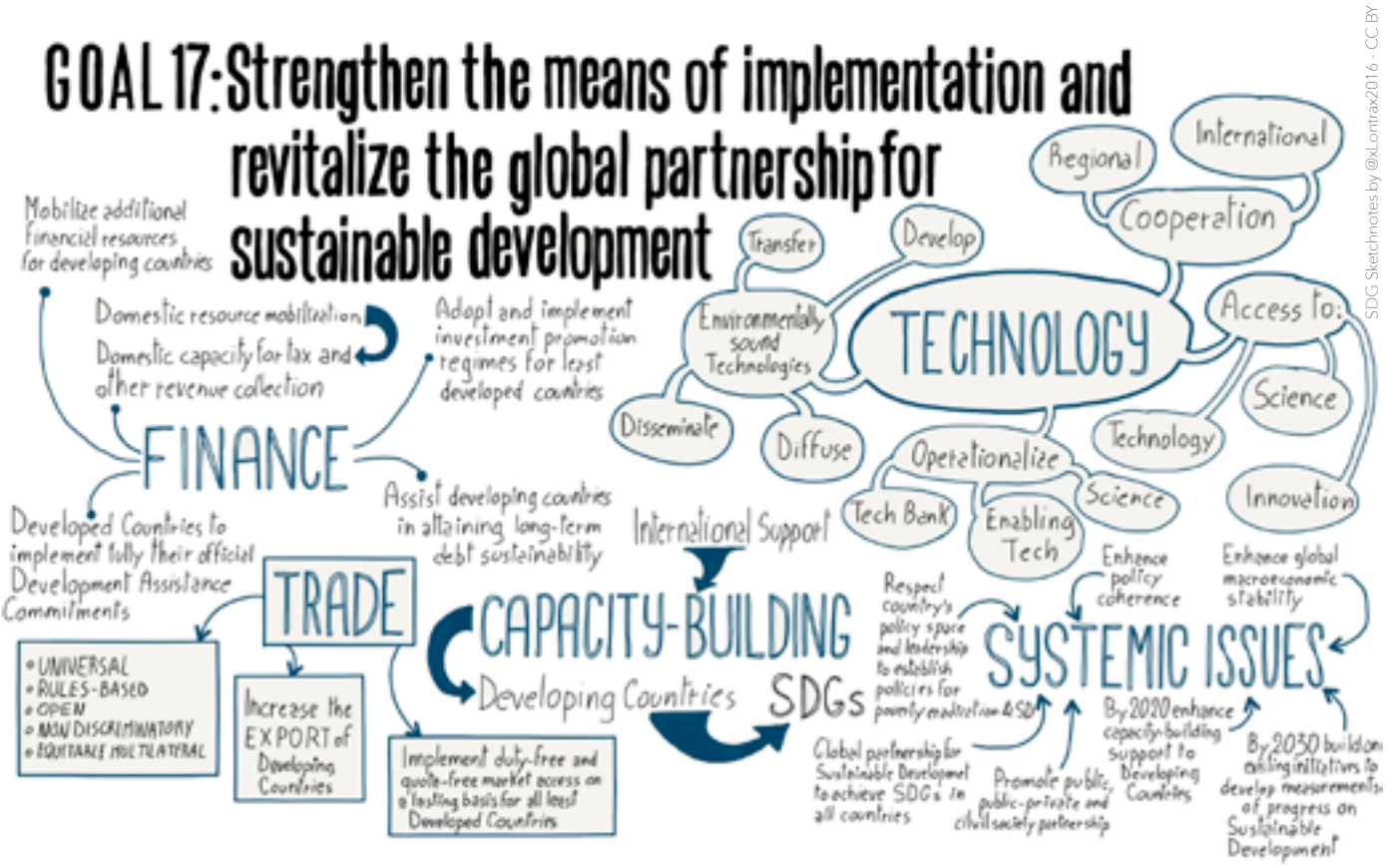
Limiting academic freedom and the expansion of knowledge and science reduces the ability to tackle most pressing global challenges revealed in the 2030 Agenda. Protecting refugee scientists and supporting their research and educational endeavors are key for securing progress. SAR enjoys consultative status with UNESCO and is relevant to all SDGs, particularly to SDG 16 (16.10) -but also to SDG 9 (9.5), SDG 4 (4.7 & 4.A) and SDG 10 (10.7).

You can support SAR by hosting threatened scholars, helping to find new sources of funding for scholarships, and raising awareness of academic freedom issues through the hosting of a SAR-Speaker event.

Scholars at Risk
Contact: Gabriela Tejada
https://cooperation.epfl.ch/scholars-at-risk-sar/
https://www.scholarsatrisk.org/

*Further SDGs*

# 17 PARTNERSHIPS FOR THE GOALS

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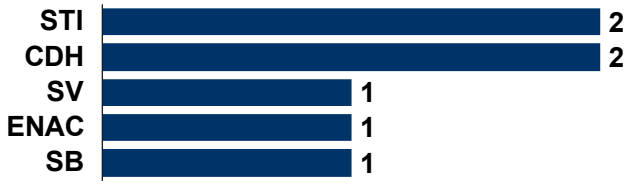
SDG 17 @EPFL

**5 Schools 7 Labs**



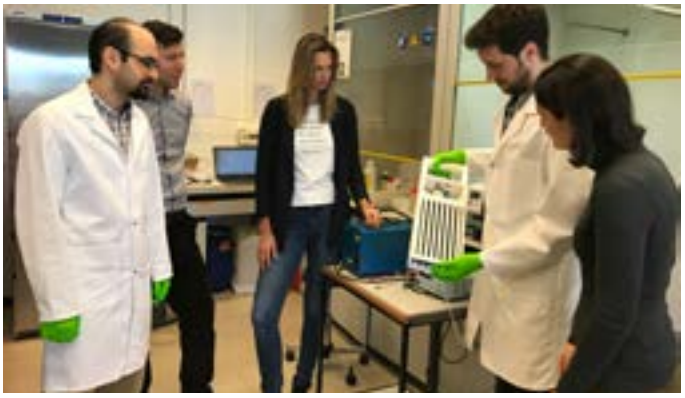

Number of labs per school

# EPFL Tech4Impact

## Building Bridges to Leverage Science & Technology for Sustainable Impact

As one of the worldwide leading technical universities and a key player for disruptive innovation in Switzerland and beyond, EPFL has a responsibility for making its unique technological expertise and innovation competencies available to society, in order to realize innovative and entrepreneurial solutions that have the potential to achieve sustainable impact. In this regard, EPFL is in the unique position to create the type of open and inspiring platform that is required for breakthrough solutions and actionable outcomes to emerge and which address the major challenges of our time.

Tech4Impact is EPFL's sustainable impact initiative under the wings of the Vice Presidency for Innovation and the key instrument for enhancing the University's scalable sustainable impact in the areas of innovation and entrepreneurship. We believe in the power of co-creation with all stakeholders and the need to break down silos to realize the transformation towards a sustainable society.



To realize this ambition, we provide a common platform to engage with students (teaching, YGrants); researchers (seed grants, Playgrants), entrepreneurs (workshops, community building), corporates (T4I Corporate Council), NGOs, international organizations, and foundations (T4I NGO Council), as well as society at large (public events).

Considering the unique ecosystem of the "Lac Léman" region, with International Geneva merely a stone throw away from the thriving academic environment of Lausanne, we engage in building bridges to fulfil the potential that multi-stakeholder partnerships hold for advancing the UN Agenda 2030 (SDG 17).

Our vision is that technology will be an essential corner stone of the sustainable society of tomorrow and that EPFL will become the trailblazer for developing technologies that benefit society.

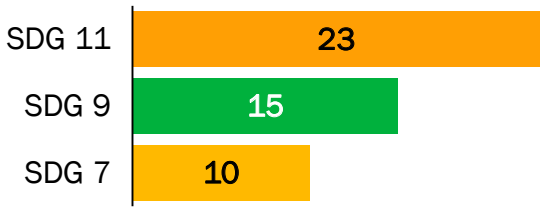
EPFL Tech4Impact
Contact: Julia Binder
https://t4i.epfl.ch

*Further SDGs*

# EPFL LABS

# ENAC

**ENAC** – School of Architecture Civil and Environmental Engineering




**42** labs on **13** different SDGs in total

**Alcherio Martinoli**
**DISAL**
**disal.epfl.ch**

DISAL's research focuses on the development of design, modeling, control, and optimization methodologies for distributed, intelligent systems. A special emphasis is currently set on distributed cyber-physical systems such as multi-robot systems and wireless sensor networks engaged in environmental monitoring missions. Based on its expertise, DISAL has been contributing to projects concerned with the monitoring of air quality in urban settings (SDG 11), microclimate parameters in alpine regions (SDG 15), and biological/physical properties of fresh water bodies (SDG 14).

**Alexandre Alahi**
**VITA**
**vita.epfl.ch**

We work on the theoretical challenges and practical applications of socially-aware Artificial Intelligence (AI), i.e., systems that can not only perceive human behavior, but reason with social intelligence in the context of transportation problems and smart spaces. Our proposed AI will democratize self-driving cars, and delivery robots. Beyond embodied agents, we will also see our living spaces – our homes, terminals, and cities – become equipped with ambient intelligence which can sense and respond to human behavior for energy optimisation.

**Alexandre Buttler**
**Ecological Systems Laboratory ECOS**
**ecos.epfl.ch**

The research of the laboratory ECOS is centred on the organization, functioning and dynamics of terrestrial plant, animal and microbial communities in relation to ecosystem processes. We study spatial and temporal dynamics of natural ecosystems, impact of management and direct and indirect human impacts (e.g. climate change, land-use change, invasion by alien species, atmospheric depositions, etc.), and ecological resilience and restoration. One of our strength is the functional link between above and belowground communities in the production of critical ecosystem services and as indicators of a changing environment. Our scientific inputs allow to provide science-based guidelines for conservation, restoration and management of natural and semi-natural sensitive terrestrial ecosystems.

**Alexis Berne**
**Environmental Remote Sensing Laboratory (LTE)**
**lte.epfl.ch**

Accurate and reliable quantification of precipitation, and in particular solid precipitation, in mountainous regions remains an open challenge that has major consequences on water resources, on natural hazards forecasting, and on the assessment of the effects of climate change in these highly sensitive regions. The main research objective of LTE is to further our understanding of the space-time dynamics of precipitation at local scales in alpine regions. To do so, we combine an experimental approach based on an X-band polarimetric radar system, on a network of disdrometers and on telecommunication microwave links, with a theoretical approach based on stochastic modelling to quantify the associated uncertainties.

**Anders Meibom**
**LGB**
**lgb.epfl.ch**

Scientific themes in the LBG are situated at the junction between isotope geochemistry and biology. We investigate biological processes at the sub-cellular level using cutting-edge micro-analytical tools. To this end, we use a suite of isotopic labeling techniques in combination with micro- to nano-scale analytical instruments. One particular focus of the laboratory of Prof. Meibom is the study of metabolic functioning of marine organisms, including corals, under environmental stress.

**Athanasios Nenes**
**Laboratory of Atmospheric Processes and their Impacts**
**lapi.epfl.ch**

Our research focuses on advancing the description of aerosols and aerosol-cloud interactions in atmospheric models through the combination of observations, theory and modeling. Our group also focuses on the development of aerosol instrumentation, measurement techniques for understanding the aerosol-cloud link and aerosol properties, such as hygroscopicity, volatility and water uptake kinetics. We are also heavily involved in field measurement programs (both ground-based as well as airborne) focused on understanding the climate and health impacts of ambient aerosol from a wide variety of sources.

**Bertrand Merminod**
**TOPO**
**topo.epfl.ch**

Our core research activity are in Geomatics engineering. Based on the scientific frame-work of Geodesy this is one of the key information technology of the 21st century that integrates acquisition, modeling, analysis, and management of spatially referenced data. The lab develops sensor platforms for environmental remote sensing, that is, mapping using various cameras (e.g. thermal, hyperspectral). This involves hardware and software to determine the position and orientation of airborne sensors (mainly drones).keywords: satellite navigation, inertial systems, environmental imagery, geo-monitoring

**Brice Lecampion**
**GeoEnergy Lab**
**gel.epfl.ch**

We work on the mechanics of fluid-solid coupling in porous materials and its applications in the fields of environmental, geo-engineering, seismology and tectonophysics. Our primary research focuses on the non-linear interplay between stresses, deformation, fracture, and fluid flow, in geo-materials with applications to different type of geo-energy projects (deep geo-thermal energy, CO2 storage etc.). By combining experimental and theoretical investigations, our aim is to improve industry practices, foster sustainable solutions and provide to decision makers, regulatory bodies, as well as the general public, expertise on fundamental and practical problems related to Geo-Energy in relation with the energy transition (SDG 7, 9, 13).

**Christian Ludwig**
**EPFL-PSI Joint Professorship on Solid Waste Treatment**
**psi.ch/cpm**

The technological development in the last 100 years has strongly increased the demands for energy and materials and this is increasingly affecting the natural materials cycles. Within the general subject of sustainable resources management our group is contributing to the technology development in the following fields: New materials for resource efficient technologies; controlling the fate of valuable and/or harmful materials; recycling, recovery and reuse of raw materials.

**Christof Holliger**
**Laboratoire de Biotechnologie environnementale**
**lbe.epfl.ch**

Environmental biotechnology is the multidisciplinary integration of sciences and engineering in order to utilize the huge biochemical potential of microorganisms for the restoration and preservation of the environment and for the sustainable use of resources. Our mission in research is to develop innovative integrated processes for the biological treatment of wastewater and the bioconversion of organic wastes. Both domains predominantly address SDG 6 Clean Water and Sanitation.

**Christophe Ancey**
**Environmental Hydraulics Laboratory**
**lhe.epfl.ch**

The research at LHE strives toward a better understanding of hydraulic processes in the environment, with particular emphasis on the problems encountered in the Alps. LHE also investigates how scientific knowledge is incorporated into land-use planning policies. The field of research covered within the LHE includes the following topics the link to energy: physics of bed load transport, aiming at better management of sediments in waterways, hydrodynamics of waterways, with the objective of studying free surface flow to better understand dynamic, transport phenomena within rivers including floods and dambreak waves (in mountain areas), and scientific models and risk management.

**Claudia R. Binder**
**HERUS**
**herus.epfl.ch**

The vision of the interdisciplinary chair for Human Environment Relations in Urban Systems (HERUS) is to support the transition towards more sustainable urban systems. Its activities include: Analyzing the structure and dynamics of urban systems – focus on the sustainability of the basic functions of urban systems, such as housing, energy, mobility and food (SDG 3, 7, 11); Conceptualizing the transition pathways of urban systems – understand the formation and uptake of sustainable habits through the interaction of diverse agents (SDG 12); Analyzing perceptions and values with regard to sustainable urban systems - analyzing the variety of indicator sets used to express the sustainability goals and eliciting preferences of actors through crowd sourcing (SDG 11, 17)

**Corentin Fivet**
**Structural Xploration Lab**
**sxl.epfl.ch**

Despite current efforts, the environmental impacts of the construction industry remain an urgent concern and new means must be found to lessen embodied energy demands and waste generation. Designers' efforts traditionally consist in developing systems that minimize material quantities and that use low-impact materials. A third strategy has recently been (re-) introduced: the reuse of components over multiple service lives. Still in its infancy, such 'circular industrial economy' disrupts the design practice in many ways. In this context, the Structural Xploration Lab forges new ways of designing load-bearing systems for architecture and structural engineering.

**Dimitrios Lignos**
**RESSLab**
**resslab.epfl.ch**

The central focus of the RESSlab is how to develop new approaches, metrics and tools to enhance resilient-based design of steel and composite-steel structures under multiple hazards. This is achieved through integrated experimental and computational research that utilizes the latest advancements in material science with high-fidelity nonlinear finite element analysis validated with multi-scale experimental testing. Research topics span across steel buildings and bridges, performance-based earthquake engineering, seismic risk and loss assessment, computational modeling of ultimate limit states such as geometric and material instabilities, multi-scale experimental testing of conventional and high-performance systems.

**Dolaana Khovalyg**
**Thermal Engineering for the Built Environment Laboratory TEBEL**
**tebel.epfl.ch**

The Thermal Engineering for the Built Environment Laboratory (TEBEL) focuses on low energy conditioning of indoor environment for comfortable working and living. Research focuses on: Energy efficient building services such as heating, ventilation, and air-conditioning; active building envelope exchanging heat and moisture efficiently between indoors and outdoors; intelligent control of indoor environment via human-building interaction; enhanced performance of mechanical systems while considering the human factor for optimized thermal comfort and indoor air quality. TEBEL is a research group within the smart living lab, which is a cutting-edge, inter-disciplinary, and interinstitutional platform focusing on sustainable buildings and well-being of occupants.

**Dusan Licina**
**HOBEL**
**hobel.epfl.ch**

The Human-Oriented Built Environment Lab (HOBEL) is the research laboratory within the smart living lab at EPFL. The focus of HOBEL is centered on advancing the knowledge of the intersections between people and buildings with an aim to ensure high indoor environmental quality for occupants with minimum energy input. The key mission of HOBEL is to improve the knowledge in the domains of indoor air quality, assessment of human exposure to airborne pollutants, dynamics and fate of pollutants in buildings, advanced energy efficient ventilation systems and controls, tools and methods building environmental monitoring, thermal comfort of humans and their behavior.

**Edgard Gnansounou**
**Bioenergy and Energy Planning Research Group BPE**
**bpe.epfl.ch**

BPE's main mission is to design and assess the introduction of new and clean technologies into the whole energy system or in particular energy supply industries (e.g. electricity, motor fuels, heat and air conditioning, etc.). The group has skills in integrated modelling of energy markets, assessment of high penetration of renewable energy and clean technologies into existing energy systems, risk analysis of energy infrastructures and natural hazards, impacts of energy systems on the environment, integration of energy facilities and infrastructures in the environment, and the development of intelligent decision-making support systems for planning and operating energy systems compatible with market-oriented and decentralized decision processes.

**Emmanuel Rey**
**Laboratory of Architecture and Sustainable Technologies (LAST)**
**last.epfl.ch**

The Laboratory of Architecture and Sustainable Technologies (LAST) focuses its research on the field of sustainable architecture, with particular emphasis on the transcription of the principles of sustainability at different levels of intervention – from urban design to building components – and for the integration of innovative and evaluative criteria into architectural design. The approach of the laboratory is the result of a combination of a holistic, interdisciplinary and evaluative approach, taking into account the environmental, socio-cultural and economic parameters, searching convergent strategies at the different levels of the built environment and optimizing the multiples performances of architectural design. The research field is more specifically focused on the scales of sustainable neighborhoods, sustainable buildings and sustainable construction components.

**Eugen Brühwiler**
**MCS - IIC - ENAC**
**mcs.epfl.ch**

The Laboratory of Maintenance and Safety of Structures (MCS) mission includes the development of examination methods for existing civil structures (f.ex. bridges) with the goal of limiting construction intervention to a minimum. If interventions are necessary, their objective must be to improve the structure, thus "getting more out of existing structures". This goal is in agreement with principles of sustainable development. MCS activity goals :Development of examination methods for structures towards more sustainable maintenance and life cycle approaches.Dissemination of MCS's innovative approach for durable maintenance interventions on existing concrete structures using advanced cementitious materials.

**Fernando Porté-Agel**
**Laboratory of Wind Engineering and Renewable Energy (WIRE)**
**wire.epfl.ch**

The main goal of our research is to improve our understanding and ability to predict turbulent transport of momentum and scalars (e.g., heat, water vapor, pollutants) in environmental flows, with emphasis on the atmospheric boundary layer and wind energy systems. Improved descriptions of those processes are developed and used in engineering, environmental and wind energy applications (e.g., weather, air quality and wind resource assessment models).

**Francois Golay**
**Laboratory of Geographic Information System**
**lasig.epfl.ch**

Geographical information plays an important role in the analysis of the structuring processes of the territory and of the landscape. It is strategic and can be valuated in a wide range of applications from land survey to molecular ecology. Large scale systems such as environment, cities or transportation systems depend on a variety of elements and factors and cannot be regarded without having recourse to geographical information. The goal is thus to model and analyze the geographical space, in which these systems reside with representation and digital tools.

**Harry Gugger**
**Laboratory Basel (LABA)**
**laba.epfl.ch**

Laba is devoted to the investigation of spatial design at the interface between urban processes and architectural objects. laba's theme urban-nature is thus a paradox that supersedes dichotomy and that, by doing so, highlights the ambiguous coexistence of these two conditions—as nature becomes increasingly urbanized, so does the urban become gradually more natural, to the point where concepts once seen as polarities can now begin to be seen as metonyms.

**Ian Smith**
**Applied Computing and Mechanics (IMAC)**
**epfl.ch/labs/imac**

We use sensors to improve knowledge of real structural behavior. This leads to improved asset management (refurbish rather than replace high-value civil infrastructure) and innovative methods for design of new structures such as minimum life-cycle energy for active structures.

**Jean-Louis Scartezzini**
**Solar Energy and Building Physics Laboratory**
**leso.epfl.ch**

The Lab's research activities focus on the development and implementation of energy efficient, renewable and sustainable energy technologies in the built environment. We pursue the following goals: Energy savings in buildings and improvement of indoor environment quality and health; Optimisation of solar energy conversion systems through nanotechnology and architectural integration; Smart management of cities thanks to modelling and simulation of complex urban systems (energy flows, solar potential and other sustainability related factors)

**Johny A. Wüest**
**Physics of Aquatic Systems Laboratory (APHYS)**
**aphys.epfl.ch**

The interest in Physical Limnology as a subject of Environmental Fluid Dynamics is threefold: Physical processes as an avenue for understanding lake ecosystems; management of natural water resources; and lakes as natural scale-up "laboratories" for stratified environmental flow studies.

**Katrin Beyer**
**Earthquake Engineering and Structural Dynamics Laboratory**
**eesd.epfl.ch**

The group "Earthquake Engineering and Structural Dynamics" (EESD) investigates the seismic response of existing structures. Many existing buildings and infrastructure do not satisfy today's norms with regard to seismic loading (SDG 9 and 11). It is impossible to replace or strengthen all. For this reason, it is crucial to identify those which expected performance will impact most the society. The assessment of existing structures requires much more accurate and sophisticated models than the design of new structures. As construction practice varies across the world we often collaborate with partners in the Global South (SDG 4 and 17). In addition, we develop tools for a fast assessment of structures after an event.

**Kristin Schirmer**
**Laboratory of Environmental Toxicology TOX**
**tox.epfl.ch**

Our research helps to protect aquatic ecosystems by understanding the effects that chemicals and other stressors have on aquatic animals. In order to characterize interactions between chemicals and organisms, we study the uptake, biotransformation, elimination and distribution of chemicals in organisms or isolated cells. Further, we link concentrations of aquatic pollutants in organisms (internal exposure) to resulting biological effects. Here we are particularly interested in their relationship on different biological levels, from the genome to cells to organisms. Both, the mechanistic understanding gained from our research as well as its representation in models are used to support the assessment of risks to the environment.

**Lyesse Laloui**
**Laboratory of Soil Mechanics (LMS)**
**lms.epfl.ch**

Beside the conventional geomechanical research activities, my research group gives priority to the protection of environment, landforms and structures from geo-hazards and industrial damage. Our experimental and modelling resources are mobilised to understand, investigate and predict the environmental impact of the new technologies such as nuclear waste disposal, and to provide tools for the up-to-date design of the geo-structures. In addition, in the context of the Chair "Gaz Naturel", we focus our activities on the geo-engineering and the CO2 storage.

**Marie Violay**
**Laboratory of Experimental Rock Mechanics LEMR**
**lemr.epfl.ch**

The objective of the Laboratory of Experimental Rock Mechanics (LEMR) is to provide a better understanding of the couplings between upper-crust mechanics and fluid movements. The evaluation of the coupled hydro-mechanical processes in high/low porosity rocks has a prime importance for: underground nuclear waste disposal, geothermal energy extraction, gas/oil recovery, carbon dioxide sequestration in deep reservoirs or yet for the landslides and earthquakes-related hazards. It has also strong implication in engineering geology topics such as tunnelling and underground constructions.

**Marilyne Andersen**
**LIPID**
**lipid.epfl.ch**

The Laboratory of Integrated Performance in Design (LIPID) engages in questions of health (SDG 3), comfort (SDG 3,11) and perception (SDG 11) and their interactions in the design and energy-efficiency (SDG 7) of the built environment, with an overall strategic goal of fulfilling building occupant needs and a core focus area on daylighting strategies. Our work involves different perspectives and methods, ranging from the human scale to the building and even urban scale, based on both simulations and experimental work. LIPID aims to bring new models, methods, metrics, decision support platforms and physical demonstrators, to enrich the designer's toolset and adopt a holistic and integrated approach in architecture.

**Michel Bierlaire**
**TRANSP-OR**
**transp-or.epfl.ch**

The Transport and Mobility Laboratory is active in modeling, optimization and simulation of transportation systems, with a specific emphasis on the mobility of individuals. We identify new solutions to transportation problems, on the ground, in the air, or on the sea, transport of people or goods, whatever the mode. We focus on technical solutions, but also on their impact on the system as a whole. We are also interested in the interactions of the transportation systems with the land use, the economy, the environment, etc.

**Paola Vigano**
**Laboratory of Urbanism**
**lab-u.epfl.ch**

Lab-U explores the possibility of conceiving the city as a renewable resource, exploring the potential of a transformation that recycles the existing to the full. Its approach intimately relates design to theory, believing in the strong capacity of the design project to produce knowledge.

**Paolo Tombesi**
**FAR**
**epfl.ch/labs/far**

FAR defines the activities of a group of researchers interested in the quality of the built world and the role of construction in bringing it about. Utopian in its resolve and pragmatic in its operational tactics, the work of FAR seeks to define material solutions to building environment challenges that are grounded in their historical, social and economic realities. In this context, architecture and construction cannot be separated: FAR is concerned with the construction of efficient architecture, interpreted as a framework for social activities and a rival investment, as much as it is interested in the architecture of construction, e.g., the 'industrial' system that enables spatial ideas to reach sound built

**Philippe Thalmann**
**LEURE**
**leure.epfl.ch**

LEURE gathers 10 researchers – economists, mathematicians, political scientists, environmental engineers - who analyze and develop policies designed to better manage our natural and built environment. Particular emphasis is placed on climate policies at the national and international level, which are simulated with large-scale computable general equilibrium models. As buildings and transportation are large emitters of greenhouse gases, those sectors are subject to more detailed modeling and analysis.LEURE is at the forefront of coupling bottom-up modeling of technologies with top-down modeling of markets. It is also at the forefront of real-estate valuation and modelling investment decision of property owners.

**Rizlan Bernier-Latmani**
**Environmental Microbiology Laboratory (EML)**
**eml.epfl.ch**

Rice is a staple for more than half of the world's population. However, the rice plant is also a hyperaccumulator of the toxic metalloid, arsenic, that is naturally occuring in most of the growing regions. Thus, virtually all types of rice accumulate some form of arsenic in the rice grain. We are interested in microbial processes in the soil that result in arsenic uptake by the rice plant (such as arsenic methylation). A better understanding of the soil biogeochemical controls on arsenic uptake will help develop cultivation strategies that minimize arsenic uptake by the plant.

**Satoshi Takahama**
**Atmospheric Particle Research Laboratory (APRL)**
**aprl.epfl.ch**

Particles in the atmosphere play an important role in climate and hydrology, civilian health, and transport of nutrient to natural ecosystems. Aerosols and their precursors can be emitted from a variety of anthropogenic and biogenic sources, and undergo chemical and physical transformations in the atmosphere. Improving our understanding of particle impacts on health and climate for present and future periods relies on a combination of modeling and measurement of aerosol emission or formation, transformation, and transport; taking into account interactions between the condensed and vapor phases. The work in this laboratory focuses on addressing these issues through the integration of various analytical and computational techniques.

**Tamar Kohn**
**LCE**
**lce.epfl.ch**

LCE's research activities focus on the control of pathogens that are transmitted by the fecal-oral route. These pathogens are shed by infected individuals and re-infect new hosts via contaminated water, food or fomites. We study the presence, fate and impacts of pathogens - mainly viruses – in the environment and in engineered treatment systems (e.g., traditional water treatment, potable water reuse, or novel sanitation processes). Our ultimate goal is to establish scientific principles that enable the design of effective pathogen control strategies. In addition, we also investigate novel technologies for the removal of organic micropollutants (e.g., antibiotics) from water.

**Thomas Keller**
**Composite Construction Laboratory**
**cclab.epfl.ch**

CCLab's research mission is to make a significant contribution to the development of a new generation of innovative high-performance infrastructure systems. Research interests focus on composite or hybrid solutions on the material, component and structural system levels with an emphasis on advanced composite materials and lightweight structures.

**Tom Battin**
**SBER**
**sber.epfl.ch**

The Chair of Ecohydraulics is engaged in fundamental research related to global change and alpine aquatic ecosystems. At the center of the various research topics figure a better understanding of the coupled physical, chemical and biological processes underlying stream ecosystem functioning and integrity, and how these may be impacted by global change. Research ranges from the ecology of biofilms, the dominant form of microbial life on Earth and particularly in streams, to the role of streams for the global carbon cycle. The Chair's laboratory combines cutting-edge experimental work, with large-scale fieldwork and sensor networks, and modeling.

**Urs von Gunten**
**LTQE**
**ltqe.epfl.ch**

The group's mission is to better understand processes, which are relevant to drinking water and wastewater quality and treatment. The main research topics were: (i) development of novel oxidative treatment systems, (ii) investigation of feasibility of oxidation processes for enhanced wastewater treatment, (iii) development of tools for prediction of transformation products and (iv) development of strategies for drinking water management. In these tasks fundamental studies are combined with real world applications in the water sector in collaborations with practitioners.

**Vincent Kaufmann**
**Urban Sociology Lab LaSUR**
**lasur.epfl.ch**

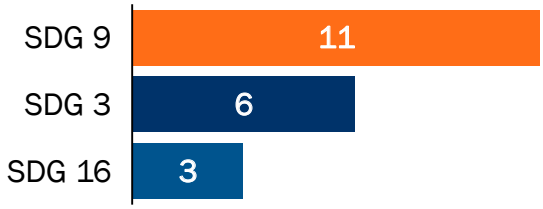
Laboratory of Urban Sociology (LaSUR) comprises of around fifteen researchers and PhD students united towards the comprehension of urban experiences within a social science perspective. Situated within the ENAC Faculty (Architecture, Civil and Environmental Engineering), the LaSUR researches the social conditions that produce and appropriate cities or territories, collaborating intensively with its partners in engineering and architecture. The LaSUR confronts urban phenomena through the mobility capacities of its actors. In this perspective, the principal research themes are daily mobility, residential history, the dynamics of suburbanization and gentrification, public space, and network management.

**Yves Weinand**
**Laboratory for Timber Constructions (IBOIS)**
**ibois.epfl.ch**

Research carried out at IBOIS aims to provide answers to one of the main architectural challenges of our time, namely sustainable architecture. With growing awareness of the need to use renewable materials in building construction, timber has been increasingly popular among researchers. In fact, its use allows to satisfy the demands of contemporary architecture as well as the requirements for sustainable construction. Latest developments and innovations in this domain have shown high potential for the design of a new generation of timber structures. Integral mechanical attachments inspired by traditional woodworking joints allow the assembly of timber panels without mechanical fasteners or adhesive bonding, and digital fabrication and parametric geometries open up new dimensions for massive timber construction and prefabrication.

# IC

**IC** – School of Computer and Communication Sciences




**19** labs on **7** different SDGs in total

**Arjen Lenstra**
**Laboratory for cryptologic algorithms**
**lacal.epfl.ch**

Design and analysis of algorithms used in cryptographic protocols or security assessments.

**Bertrand Dutoit**
**Applied Superconductivity Group**
**appliedsc.epfl.ch**

Our main research fields are the measurements, modelling and characterization of high-Tc superconductors. This kind of materials can carry very large electrical currents with very low energy dissipation (compared to traditional copper or aluminum conductors) and they can be, therefore, used in new generation power systems for devices such as fault current limiters, electric cables, transformers, motors and generators. Among the main impediments to an immediate large scale industrial utilization of the high-Tc superconductor technologies are the AC losses occuring in the presence of alternating transport currents and/or magnetic fields.

**Boi Faltings**
**Artificial Intelligence Laboratory**
**lia.epfl.ch**

The modern world is full of artificial, abstract environments that challenge people's natural intelligence. The goal of our research is to develop artificial intelligence that helps people master these challenges. For example, in the Opensense project, we consider aggregating information from mobile and fixed air quality sensors into a single coherent air quality map.

**Bryan Ford**
**Decentralized and Distributed Systems**
**dedis.epfl.ch**

The DEDIS team is working on projects related to large-scale collective authorities (cothorities), which distribute trust among a number of independent parties to allow scalable self-organizing communities. With no single trusted party, cothorities can secure software updates, provide public randomness, enable privacy-conscious medical-data sharing and a lot more. Other projects include communicating securely over insecure channels and fast, scalable, accountable anonymous communication.

**Carmela Troncoso**
**Security and Privacy Engineering Laboratory**
**spring.epfl.ch**

At the SPRING Lab we perform research related to the design and evaluation of secure and privacy-friendly ICT systems for a wide range of applications. Our research focuses on building secure and privacy-preserving systems. We aim to develop tools and methodologies to help engineers embedding strong security and privacy guarantees in their designs, as well as techniques that help them to systematically quantifying the information that an adversary can infer from data she may have access to.

**Christoph Koch**
**Data Analysis Theory and Applications Laboratory**
**data.epfl.ch**

The EPFL DATA lab performs research and teaching at the intersection of systems, programming languages, and theory. We create and study database systems and large-scale data analysis ("big data") systems.

**George Candea**
**Dependable Systems Lab**
**dslab.epfl.ch**

We develop techniques and abstractions for building trustworthy computer systems, i.e., systems that are safe and secure. In our work, we: enjoy exploring the fundamental challenges posed to security and safety by large-scale systems consisting of many threads, many nodes, and millions of lines of code written by many programmers; seek solutions that solve real-world problems by overcoming theoretical worst-case limitations; build prototypes that directly improve the lives of real users and evaluate them on real-world workloads; operate at the intersection of operating systems, distributed systems, programming languages, formal methods, and computer architecture

**Giovanni De Micheli**
**Integrated Systems Laboratory**
**lsi.epfl.ch**

The ILS studies design technologies for circuits and systems. Topics of research include, but are not limited,to: Design and fabrication of bio-sensors and bio-interfaces, such as protein and ion sensors, to probe biological mechanisms for both clinical and biodiscovery objectives. Specific examples are the design of wearable medical devices for continuous real time metabolic monitoring and the design of intelligent, safe and reliable drug delivery system.

**James Larus**
**Very Large Scale Computation Lab**
**vlsc.epfl.ch**

The Very Large Scale Computation Lab (VLSC) is trying to solve some of the key software and hardware challenges of building global-scale services. These services may encompass tens of geo-distributed datacenters, each of which can contain tens of thousands of servers. Compounding these challenges of scale and distribution, the services have very high availability and responsiveness requirements, and they are under continual development and evolution.

**Jean-Pierre Hubaux**
**Laboratory for Security and Privacy**
**lca1.epfl.ch**

Our research aims at laying the foundations and developing the tools for protecting privacy in tomorrow's hyper-connected world. Over the last 15 years, our lab has pioneered the areas of privacy and security in mobile/wireless networks and in personalized health.

**Karl Aberer**
**LSIR**
**lsir.epfl.ch**

We believe that the future of IT in the 21st century belongs to systems that are truly distributed, self-organizing, and capable to quickly respond to changes of their environment. Our research focuses on efficient peer-2-peer systems, trust management, large-scale semantic interoperability, and self-organization in decentralized information systems. For instance, we are exploring techniques of managing data captured by sensors in a sustainable way, involving communities into the sensing tasks. Furthermore, we are investigating a wide range of statistical, machine learning and game-theoretic techniques for enabling trusted interaction in today's Web; and we study distributed algorithms to enable fair resource sharing in a variety of environments, such as peer-to-peer systems.

**Mark Pauly**
**Computer Graphics and Geometry Laboratory (LGG)**
**lgg.epfl.ch**

Our goal is to understand fundamental principles of geometric computing and leverage these insights to develop new algorithms and tools for 3D shape analysis, simulation, design, and fabrication. Our research explores the interface of several scientific disciplines, such as mathematics, computer science, materials science, and architecture to facilitate innovative computational design solutions for advanced manufacturing and construction.

**Matthias Payer**
**HexHive Laboratory**
**hexhive.epfl.ch**

In the HexHive group at EPFL, our research focuses on systems security. Despite efforts and improvements in bug discovery techniques, applications will always have some remaining vulnerabilities that may be exploited by an attacker. We target techniques that enable developers to discover and remove bugs in software systems as well as making programs resilient against the exploitation of unknown or unpatched vulnerabilities.

**Patrick Thiran**
**LCA3**
**indy.epfl.ch**

Our research focuses broadly on the statistical modeling of large dynamical systems involving both human and technical agents. Examples include social and information networks, epidemic processes, human mobility and transportation, and recommender systems. Our work lies at the intersection of machine learning, probabilistic modeling, large-scale data analytics, and performance analysis.

**Pierre Dillenbourg**
**Computer-Human Interaction in Learning and Instruction**
**chili.epfl.ch**

We conduct research on our digital technologies may enhance education: robots for elementary school, augmented reality for vocational education (carpenters, florists,…), machine learning for education (adaptive instruction), computer-supported collaborative learning, classroom orchestration, online education (MOOCs,…), etc. We have also founded an incubator for EdTech start-ups, the Swiss EdTech Collider, with 3 other EPFL labs (Gillet, Mondada, Salathé). CHILI is part of LEARN, the new EPFL Center for Learning Sciences

**Robert West**
**Data Science Lab**
**dlab.epfl.ch**

The Data Science Lab aims to turn vast amounts of digital traces into actionable, useful insights on human behavior and tools for improving our lives. The lab collaborates closely with the Wikimedia Foundation, in projects that aim to facilitate worldwide access to knowledge for free, decreasing inequalities in the distribution and creation of knowledge, and ultimately improving education (SGD 4). The lab is also conducting research on improving nutrition and health using data science (SGD 3).

**Ronan Boulic**
**Immersive Interaction Group**
**iig.epfl.ch**

Our researches focus on involving users through full-body movements to ease the evaluation of potentially complex environments. We also investigate how to impersonate a full range of potential users (ergonomic evaluation) or characters (performance animation). Non-invasive methods are explored for training and rehabilitation. Our Know-how in human posture control is also used for proposing new tools for animators.

**Serge Vaudenay**
**Security and Cryptography Laboratory**
**lasec.epfl.ch**

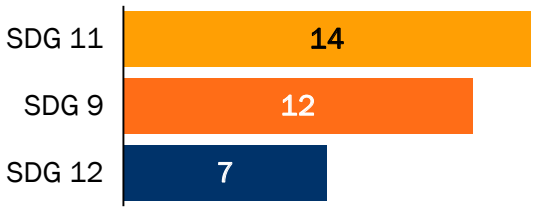
The main activities of LASEC are research and education on the security of communication and information systems, cryptography, and applications. More specifically: Cryptographic analysis: security analysis (security proofs, attacks) of cryptographic primitives; Lightweight cryptography: design and analysis of cryptographic primitives in constrained environments (stream cipher, key agreement, RFID privacy); Secure communication channels: key agreement, authentication and confidentiality, privacy

**Wulfram Gerstner**
**Laboratory of Computational Neuroscience**
**lcn.epfl.ch**

At the LCN, we use neural modeling in order to understand the role of dynamics for computation in brain-like structures. Dynamics and temporal aspects play a role on all levels of information processing in the brain. On the neuronal level, we study aspects of temporal coding by `spikes', i.e., the short electrical pulses (action potentials) that neurons use for signal transmission. On the behavioral level we focus on the dynamics of spatial navigation in a known or unknown environment.

# SB

**SB** – School of Basic Sciences




**38** labs on **12** different SDGs in total

**Ambrogio Fasoli**
**Swiss Plasma Center**
**spc.epfl.ch**

The primary goal of the Swiss Plasma Center is to contribute the success of the ITER project and to the completion of the physics and technology basis for DEMO. While ITER will demonstrate the scientific and technological feasibility of fusion, DEMO will prove its potential as an economically attractive source of base-load electricity compatible with sustainable development. The TCV tokamak, the main asset of the Swiss Plasma Center, and the largest EPFL experimental facility, is of the leading European facilities that accompany the ITER program. In addition, the Swiss Plasma Center exploits fusion and plasma spin offs for societal applications.

**Anders Hagfeldt**
**LSPM**
**lspm.epfl.ch**

At LSPM we combine basic and applied research aiming to improve our fundamental understanding of the materials, interfaces and devices to improve performances of dye-semsitized solar cells in terms of efficiency, stability and processability.

**Andreas Züttel**
**LMER**
**lmer.epfl.ch**

The LMER lab researches Energy Storage materials, such as Hydrogen or Hydrides, but also approaches to CO2 Reduction, Hydrocarbons and Catalysis.

**Ardemis Boghossian**
**Laboratory of NanoBiotechnology (LNB)**
**lnb.epfl.ch**

The Laboratory of NanoBiotechnology (LNB) works at the interface of nanomaterials engineering and bioengineering to create optical devices that benefit from the synergy in these fields. We focus on two optical applications: optical biosensing and light-harvesting energy. We develop sensors based on carbon nanotubes that use light as a signal for measuring analytes in living cells and in the body. These sensors allow us to continuously monitor a patient's health and detect early stages of diseases. We also create living energy devices, such as living photovoltaics and fuel cells, based on bioengineered microbes that can convert energy.

**Beat Fierz**
**LCBM**
**lcbm.epfl.ch**

Our main focus is to understand the molecular organization and function of chromatin, the DNA-protein complex which organizes the eukaryotic genome and regulates gene expression, using a combination of chemistry and biophysics

**Berend Smit**
**LSMO**
**lsmo.epfl.ch**

The common theme in my research is molecular simulations. One of the advantages of doing computer simulations is that changing a topic does not require a new machine, which allowed me to explore very different fields. In reverse chronological order the topics I have worked on include: Methane Storage, Carbon Capture, Biological Membranes, Simulation techniques, Separations, Swelling of Clays, Zeolites, Surfactants, Phase equilibrium.

**César Pulgarin**
**GPAO**
**gpao.epfl.ch**

Wastewaters coming from many (agro) industrial activities, as well as certain natural mediums ( ground water, rivers, lakes…) and inner air, often contain toxic chemical pollutants and microorganisms, which are not eliminated by existing treatments. In this context, the GPAO looks for the scientific understanding and the development of new processes for the destruction of bio-recalcitrant compounds and pathogenic microorganisms present in water and air. In order to contribute to fragile populations' from Latin America and Africa, à long term collaboration is developed with universities from these regions especially in the development of solar photo-catalytic process for wastewater treatment and drinking water supply. In order to contribute to fragile populations' from Latin America and Africa, à long term collaboration is developed with universities from these regions especially in the development of solar photo-catalytic process for wastewater treatment and drinking water supply.

**Christian Heinis**
**LPPT**
**epfl.ch/labs/lppt**

Our laboratory is engaged in the discovery and development of new molecule designs for the use in therapy. A major focus is the development of bicyclic peptide ligands of disease targets using a combinatorial approach based on phage display.

**Christian Theiler**
**Swiss Plasma Center**
**spc.epfl.ch**

Nuclear fusion has the potential to become a clean, safe, and virtually inexhaustible source of electric power production for future generations. The goal of Prof. Theiler's group and of the entire Swiss Plasma Center at the EPFL is to help resolving existing scientific and technological challenges and to contribute to the success of the next step fusion experiment ITER and the subsequent demonstration fusion power plant DEMO.

**Elena Goun**
**Laboratory of Bioorganic Chemistry and Molecular Imaging (LCBIM)**
**lcbim.epfl.ch**

LCBIM develops synthetic chemistry, optical imaging, and understanding of cellular functions at molecular level to find solutions to fundamental problems in biology and the medical sciences.

**Emmanuel Abbe**
**Mathematical Data Science**
**mds.epfl.ch**

Emmanuel Abbe is regarded as one of the world's leading experts in data science, working at the interface of mathematics, information theory, statistics and theoretical computer science. His area of expertise is stochastic block model analysis, and his advances are important to a number of other subject areas, e.g. human biology, genomics, and the analysis of artificial neural networks.

**Gabor Laurenczy**
**GCEE**
**gcee.epfl.ch**

GCEE researches the topics of Hydrogen storage, "green" energy, high pressure chemistry - up to 2000 bar, homogeneous catalysis and hydrogenation.

**Hubert Girault**
**LEPA**
**leap.epfl.ch**

Our laboratory is engaged on two fronts:
Healthcare - the development of new diagnostics for personalized allergens detection, melanoma screening and antibiotic resistance detection.
Energy - the development of large-scale redox flow batteries, the development of service station for electric vehicles either with batteries or hydrogen fuel cells

**Jacques Moser**
**GDP**
**gdp.epfl.ch**

The aim of the Photochemical Dynamics Group is to contribute to the advancement of solar energy conversion science and technology through fundamental research. Efforts focus in particular on scrutinizing the mechanisms and dynamics of light-induced electron transfer and charge separation at donor-acceptor heterojunctions and in supramolecular assemblies.

**Jan S Hesthaven**
**MCSS**
**mcss.epfl.ch**

The Chair of Computational Mathematics and Simulation Science develops novel computational techniques to solver large scale problems across the sciences and engineering. There is a substantial activity that seeks to merge traditional methods with modern data driven methods to facilitate the predictive modeling of complex systems with applications to energy, natural disaster modeling, and system modeling. Activities span the spectrum of mathematical analysis of new methods to the modeling of complex problems using high performance computing.,

**Jean-Philippe Ansermet**
**LPMN**
**lpmn.epfl.ch**

The lab makes nanostructures in the form of nanowires produced by electrodeposition for applications like NMR and terahetz technology.

**Jeremy Luterbacher**
**Laboratory of Sustainable and Catalytic Processing**
**lpdc.epfl.ch**

The Laboratory of Sustainable and Catalytic Processing is generally interested in making processes and the chemicals they produce greener and more sustainable. Several areas of interest include: Biomass conversion, Heterogeneous catalysis, Lignin chemistry, Biocatalysis, Green solvents

**Joao Penedones**
**Fields and Strings Laboratory**
**fsl.epfl.ch**

The research activities at FSL are focused on Particle and Gravitational Physics. Our work is theoretical and rather removed from immediate practical applications. However, the shared scientific endeavor of humanity to understand the fundamental laws of Nature provides a privileged perspective and produces a culture of cooperation across borders (SDG 16, 17). We also contribute to SDG 4 by providing an excellent scientific education to our students at EPFL and to many other students at international PhD schools. Moreover, our scientific papers and many recorded seminars are freely available online (e.g. at arxiv.org).

**Kay Severin**
**LCS**
**lcs.epfl.ch**

Nitrous oxide (N2O, 'laughing gas') is nowadays making the headlines as a greenhouse gas and ozone-depleting substance. We develop novel chemical processes, which allow to do something 'useful' with this environmentally problematic gas. Two directions are explored: a) the utilization of N2O as oxidant in in transition metal catalyzed reactions, and b) the utilization of N2O as a building block for more complex organic molecules.

**Kumar Varoon Agrawal**
**LAS**
**las.epfl.ch**

The Laboratory of Advanced Separations (LAS) is engaged in novel material engineering approaches in the field of energy-efficiency in industrial processes focusing on molecular separations including gas separation, hydrogen purification, carbon capture, pervaporation, solvent recovery, water purification, wastewater treatment, etc. The primary approach is to engineer thin, down to a single-atom-thick, nanoporous membranes reducing the typical energy required for molecular processing. The group has developed and patented atom-thick membranes for hydrogen purification and carbon capture (SDG 9). The group is developing a novel technology to use the industrial waste heat and solar energy (SDG 7 and 9) to purify water (SDG 6) and generate steam.

**László Forró**
**LPMC**
**lpmc.epfl.ch**

The activity of the Laboratory of  Physics of Complex Matter (LPMC) covers a broad range of topics. In all the cases, whether it concerns superconductivity, movement of dislocations or living cells, the common denominator is complexity.

**Laurent Villard**
**Swiss Plasma Center**
**spc.epfl.ch**

The theory group at SPC is dedicated to the understanding of fundamental physical phenomena taking place in fusion plasmas. This understanding is essential in order to provide an interpretation of the experimental results from current fusion experiments and offer suggestions to improve current and future devices.

**Lyndon Emsley**
**LRM**
**lrm.epfl.ch**

Our group focuses on the development of experimental NMR spectroscopy methods to determine atomic-level structure and dynamics in molecular and materials sciences. We use the methods we develop to solve problems that were previously inaccessible in complex systems such as enzymes, catalytic nanoparticles, photovoltaic materials, and pharmaceutical compounds.

**Maryna Viazovska**
**Number Theory**
**tn.epfl.ch**

The Chair of Number Theory currently focuses on the following topics:
The theory of automorphic forms
Applications of automorphic forms to harmonic analysis and differential equations
Packing problems
Optimal configurations of points in geometric spaces.

**Mazzanti Marinella**
**GCC**
**gcc.epfl.ch/mazzanti**

Prof. Marinella Mazzanti is involved in diverse activities of fundamental research directed to develop and understand the transformation of cheap and largely available carbon and nitrogen sources from air, such as CO2 and N2 into valuable chemicals or fuels using carefully designed molecular metal compounds.

**Micahel Grätzel**
**LPI**
**lpi.epfl.ch**

Mesoscopic dye-sensitized solar cells.
Perovskite solar cells.
Light emitting diodes, electroluminescent devices and redox flow batteries.
New pigments and sensitizers, ionic liquids and solid state hole conductors.

**Mohammad Khaja Nazeeruddin**
**GMF**
**gmf.epfl.ch**

The GMF team is involved in developing organic/inorganic lead halide Perovskite Solar Cells, which are low-cost, solution processable, and yet provide solar to power conversion efficiency similar to silicon solar cells. Armed with desired optical and electronic properties of perovskite materials, the research at GMF is focused on interface engineering via compositional and dimensional tuning of perovskite materials to enhance the durability and deviceperformance beyond 24%. We have developed layer-by-layer growth of 3-dimensional and 2-dimensional perovskites yielding solar to power conversion efficiency of 22.5% certified at Newport calibration PV lab, on 7th February 2019.
Conclusion: Dimensional tailoring of hybrid perovskites is a new direction for stable solar cells that provide affordable renewable energy to all.

**Nicolas Grandjean**
**LASPE**
**laspe.epfl.ch**

LASPE's research activity aims at exploring novel quantum structures based on III-nitride semiconductors for both photonics and electronics. This covers a broad research area starting from physics of wide-bandgap optical cavities and nanostructures to device technology. LASPE has been involved in the development of short-wavelength light emitters for high-efficiency solid-state lighting.

**Oliver Kröcher**
**Group of Catalysis for Biofuels**
**gcb.epfl.ch**

The Group of Catalysis for Biofuels (GCB) works together with the Bioenergy and Catalysis Laboratory at the Paul Scherrer Institut on the development of highly efficient processes for the catalytic conversion of biomass to biofuels.The use of biomass for energy production closes the carbon cycle, which prevents further climate change. This way, energy supply in the future will become clean and sustainable. Moreover, the switch from a fossil-based energy system to a biomass-based energy system will most likely result in smaller energy production sites close the places of biomass production. This enables local economic cycles and the potential for the economic development of remote places.

**Paul Dyson**
**LCOM**
**lcom.epfl.ch**

We are engaged in the development of processes that transform waste into clean and sustainable fuels, chemicals and foods. We are studying ways to fix carbon dioxide to afford a range of different products, to transform plastic waste into fuels and to breakdown inedible food waste into nutritious food sources. We are also interested in finding sustainable approaches to treat certain neglected diseases. We have successfully commercialized some of our research.

**Philip Moll**
**Laboratory for Quantum Materials**
**lqm.epfl.ch**

The way we generate, transport and use energy is a core research field in the area of materials (SDG 7, 12). With the advances of digitalization and internet-of-things, the global energy consumption for computation and server farms is skyrocketing (e.g. a google search consumes about 0.3Wh of energy, SDG 9,11). My group researches how novel materials can lead to more efficient electronics and enable entirely new classes of devices beyond current silicon-based technology.

**Philippe Michel**
**TAN**
**tan.epfl.ch**

Analytic Number Theory is the branch of number theory that studies properties of integers (and especially prime number) using principally methods from analysis.

**Raffaella Buonsanti**
**LNCE**
**lnce.epfl.ch**

The Laboratory of Nanochemistry for Energy (LNCE) focuses on developing and understanding the chemistry behind materials that convert CO2 into useful products while storing energy from renewable sources (SDG 7, 13)

**Rolf Grutter**
**LIFMET**
**lifmet.epfl.ch**

Our lab is interested in the non-invasive measurement of metabolic processes and function. We are developing new approaches (multinuclear spin physics and metabolic modeling, among others) allowing to measure metabolic reactions in vivo hitherto inaccessible, in the context of biomedical problems of interest in rodent models of health and disease (neurochemistry and diabetes research, among others), as well as with human volunteer subjects.

**Sandrine Gerber**
**GBF**
**gbf.epfl.ch**

The research activities of our group are devoted to the development of new chemical entities for bio-applications. We are mainly interested in the design, synthesis and evaluation of functionalized nanomaterials and biomaterials for therapeutic applications as imaging probes, theranostics and cell transplantation devices.

**Suliana Manley**
**LEB**
**leb.epfl.ch**

We use super-resolution fluorescence imaging techniques combined with live cell imaging and single molecule tracking to determine the structure and dynamics of protein assemblies.

- Super-resolution fluorescence microscopy (PALM/STORM, SIM)
- High-density single molecule tracking (sptPALM)
- Cellular biophysics of mitochondrial homeostasis and bacterial cell division

**Vassily Hatzimanikatis**
**LCSB**
**lcsb.epfl.ch**

At the LCSB, we work at the interface of synthetic and systems biology to identify the design principles of biological processes for medical and biotechnological applications.

**Wendy Queen**
**LFIM**
**lfim.epfl.ch**

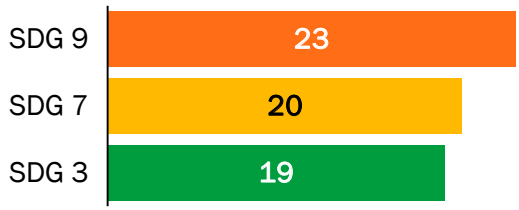
LFIM develops highly innovative hybrid organic/inorganic composite materials for environmental applications. Our research interests are threefold: 1) Greenhouse effect alleviation through carbon dioxide capture and further conversion into value-added chemicals (SDG 13), 2) wastewater purification from heavy elements (SDG 6) and extraction of precious metals through urban mining (SDG 12), 3) development of solar fuels as renewable energy sources (SDG 7), as well as biomass valorization and waste-to-energy conversion (SDG 12).

**Xile HU**
**LSCI**
**lsci.epfl.ch**

Our main research goal is to develop catalysts that are made of earth-abundant elements for chemical transformations that are related to synthesis, energy, and sustainability. Towards this goal, we currently focus on base metal catalyzed C-C bond forming reactions, C-H bond functionalization, (electro)catalytic water splitting, activation of small molecules such as CO2, H2, O2, as well as the development of synthetic models for the active site of metalloenzymes.

# STI

**STI** – School of Engineering




**42** labs on **16** different SDGs in total

**Aleksandra Radenovic**
**LBEN**
**lben.epfl.ch**

The lab is interested in using novel nanomaterials and experimental techniques to study fundamental questions in molecular and cell biology. Specific research topics include: Single molecule biophysics, Solid State Nanopores, Optical tweezers, Second Harmonic Generation, Super-resolution microscopy, Signaling, Cleanroom processing.

**Andreas Mortensen**
**LMM-IMX-STI**
**lmm.epfl.ch**

Our activities and interests span the entire spectrum from materials processing to the exploration of links between the microstructure and the properties of materials. Materials we study are made at least in part of metal and can be destined for structural or for functional applications. Our approach is largely but not exclusively experimental and touches upon a number of subtopics of materials science. These include capillarity, infiltration, powder densification, phase transformations including solidification, composite and cellular materials, micromechanics, damage and fracture, dislocational plasticity and creep, and the physics of conduction.

**Anja Skrivervik**
**MAG**
**mag.epfl.ch**

The Microwaves and Antennas Group (MAG) research focuses on antennas and passive mm-wave and microwave components, covering the theoretical modeling, design process and characterization of these structures. Current research interests comprise antennas for smart wearables such as implants for health applications (SDG3), mm-wave antennas, cavities for microwave sensors (SDG11), and periodic structures.

**Anna Fontcuberta i Morral**
**Laboratory of Semiconductor Materials**
**lmsc.epfl.ch**

The Laboratory of Semiconductor Materials works on semiconductor materials for next generation solar cells and computing schemes. We investigate the use of nanostructures in order to rationalize the use of scarce materials and at the same time increase the functionality (e.g. improved light absorption). We also investigate novel compound semiconductors with optimal optical and electrical properties that could be used in large-scale production of solar cells. These compounds are made of elements highly abundant in the earth crust such as zinc phosphide.

**Bruno Correia**
**Laboratory of Protein Design and Immunoengineering**
**lpdi.epfl.ch**

The group is designing novel functional proteins to be used for practical purposes such as therapeutics, vaccines, biosensors and others.

**Catherine Dehollain**
**SCI STI CD (RF IC group)**
**rfic.epfl.ch**

The research of RFIC Group covers the design and implementation of communication systems, remotely-powered sensing systems for biomedical applications, radio-frequency identification (RFID), wireless sensor networks (WSN), internet of things (IoT), and UWB systems.

**Christian Enz**
**ICLAB**
**iclab.epfl.ch**

The ICLAB is focused on the design of low-power and low-voltage analog and RF CMOS integrated circuits, on the modeling of advanced semiconductor devices with a particular focus on the MOS transistor for analog and RF design, and on the design of low-power error tolerant circuits and systems.

**Christophe Ballif**
**PV-LAB**
**pvlab.epfl.ch**

Current activities of the laboratory cover a broad spectrum, ranging from fundamental research to industrial technology transfer. The lab masters processes of device fabrication for a wide variety of transparent conductive oxides, thin-film solar cells and high-efficiency crystalline silicon solar cells. It also has expertise for specialty detectors. It has full facilities for packaging of PV products. It has been designated as a center of national importance by the Swiss Federal Office for Energy.

**Christophe Moser**
**LAPD**
**lapd.epfl.ch**

We are developing photonics devices that control light at the nano and microscopic scale to engineer applied systems at the macroscopic scale. For example, we use holographic structures in polymer and glass materials to manipulate light.

**Danick Briand**
**EnviroMEMS**
**lmts.epfl.ch**

The group is working on the development of environmentally-conscious Microsystems, green microtechnologies and microfabrication, and microsystems for environmental and energy applications. Future outlook for research encompasses the field of sensors and Microsystems include energy harvesting, polymeric and Power MEMS, printed sensors and microsystems, and energy autonomous smart systems.

**David Atienza Alonso**
**Embedded Systems Laboratory (ESL)**
**esl.epfl.ch**

The Chair of the Embedded Systems Laboratory (ESL) is an expert on the next-generation of embedded systems for the Internet of Things (IoT) context. ESL has been working for more than 10 years on smart wearables to improve human health and well-being (SGD 3), as well as autonomous IoT devices to improve industry efficiency and energy-efficient ICT infrastructures and data centers (SGD 9). Lately, ESL has performed research at system level (hardware and software optimizations) to develop new edge computing multi-core architectures that can intelligently interact in large-scale networks of IoT devices to create sustainable cities and communities (SGD 11).

**Demetri Psaltis**
**Optics Laboratory**
**lo.epfl.ch**

Part of Optics Lab's research is focused to provide inexpensive and onsite solutions for water disinfection and renewable energy storage through hydrogen. Few prototypes have been made for water treatment with the goal of providing a sustainable supply of disinfectant for water treatment and hygiene to the target communities (SDG 6). Matching supply and demand of energy coming from renewables through H2 as a clean fuel is another track that LO is pursuing (SDG7). The electrolyzer under development makes H2 energy economically viable and as a result, alleviates the CO2 related global issues (SDG 13).

**Dennis Gillet**
**Coordination and Integration Systems Group - REACT**
**react.epfl.ch**

The interdisciplinary research carries out in the React Group aims at handling coordination and interaction challenges using systems engineering methodologies. The underlying approach is to exploit in an integrated manner the dynamical couplings that exist between users, devices and information systems to ease adoption and improve usability in distributed frameworks. Innovative domains of deployment are cyber physical systems, autonomous transportation systems, social media for digital education and knowledge management, as well as humanitarian technology.

**Diego Ghezzi**
**LNE**
**lne.epfl.ch**

Our laboratory is a multidisciplinary environment promoting cross-fertilization among various expertise. We bring materials science, engineering, life science, and medicine together by the convergence of physicists, engineers, neuroscientists, and ophthalmologists cooperating to accomplish innovative projects. Our mission is the development of application-driven solutions based on compliant, minimally invasive, and replaceable neuroprosthetic devices. Ultimately, we aim at translating our research findings into clinical practice.

**Dimitri Van de Ville**
**MIPLAB**
**miplab.epfl.ch**

The MIP:lab is focusing on computational neuroimaging by developing new data analysis techniques that can provide insights into fundamental mechanisms of brain function, as well as biomarkers for brain disease and disorder that can improve diagnosis and prognosis (SDG 3). For the latter, we are actively collaborating with clinical partners through several applied projects. As we aim to make our research (typically under the form of software implementations) maximally open and publicly available, we indirectly also hope to reduce inequalities (SDG 10).

**Dimitrios Kyritsis**
**SCI-STI-DK, ICT for Sustainable Manufacturing**
**ict4sm.epfl.ch**

The group of ICT for Sustainable Manufacturing (ICT4SM) is involved in various Swiss and EU funded research projects in close collaboration with Swiss and European industrial partners. To respond to the scientific challenges on the topic of Circular Manufacturing - a key enabler of Circular Economy - the following activities have been defined within ICT4SM: Closed-Loop Lifecycle Management, Semantic Modelling and Reasoning for Lifecycle Engineering Applications including predictive maintenance using smart Product Embedded Information devices, methodologies and algorithms for data, information & knowledge transformation etc. ICT4SM's mission is to (i) improve the sustainable development of products, (ii) increase the productivity of manufacturing systems and (iii) optimize the operation of product recovery systems.

**Drazen Dujic**
**Power Electronics Laboratory**
**pel.epfl.ch**

The research interests of the Power Electronics Laboratory are in the broad area of the Electrical Energy Generation, Conversion and Storage. In particular, we are interested into High Power Electronics Technologies for Medium Voltage applications, those operating with voltages in kV range, currents in kA range and powers in MW range. Power Electronics is one of the key-enabling technologies for the future energy systems, as it offers unprecedented flexibility for the integration and control of various electrical sources, storage elements or loads into the grid.

**Elison Matioli**
**POWERlab**
**powerlab.epfl.ch**

Our mission is to innovate semiconductor devices with nanoscale design of high-performance materials to exploit their unique properties and conceive new, drastically more efficient devices that outperform the state-of-the-art

**Esther Amstad**
**SMaL**
**smal.epfl.ch**

We are developing composites with mechanical properties that closely resemble those of natural counterparts and hence that can be used for biomedical applications. To achieve this goal, we are developing bio-inspired drop-based processing tools to control the structure and local composition of these materials.

**Farhad Rachidi**
**EMC**
**emc.epfl.ch**

The Electromagnetic Compatibility Lab is interested in the science and technology of electromagnetic compatibility, with special focus on high power electromagnetics, lightning physics and protection, and electromagnetic time reversal.

**Francesco Stellacci**
**SuNMIL**
**sunmil.epfl.ch**

SuNMIL (Supramolecular Nano-Materials and Interfaces Laboratory) is a vibrant group of researchers that combine multiple backgrounds and integrate various disciplines to create and investigate novel materials that tackle the experimental investigation of supramolecular interfaces.

**Francois Marechal**
**industrial process and energy systems engineering**
**ipese.epfl.ch**

The Industrial Process and Energy Systems Engineering group develops engineering methods for a rational use of energy and an increased share of renewables in industrial processes, urban systems and mobility applications. Based on advanced modeling and optimization techniques, the methods help engineers to design the future process and energy systems that integrates renewable energy sources, by the defining the type of technologies, their sizes and the way that have to be operated to supply the energy services to the society. Applying the life cycle assessment concepts, the engineering methods consider not only the economical costs or profits but also the impact on resources and on the environment with a holistic and integrative approach.

**Frank Nüesch**
**Empa - Laboratory for Functional Polymers**
**empa.ch/web/empa/functional-polymers**

The Laboratory for Functional Polymers is devoted to the research and development at the forefront of novel organic materials and polymers with unique functional properties, designed for future technological applications.

**Guillermo Villanueva**
**NEMS**
**nems.epfl.ch**

The ANEMS Lab at EPFL focuses on the development of micro- and nano- electromechanical resonators that can serve as sensors for manifold magnitudes and as fundamental elements for communication (filters and oscillators). A big part of our interest is based on the use of our sensors for point of care devices to perform better and less invasive diagnostics, and another big part to help monitor air quality and structural soundness of industrial buildings and machines, including wind turbines, plane engines, etc. Another big part of our research focuses on the development of 5G communications, by developing novel filter solutions.

**Holger Frauenrath**
**LMOM**
**lmom.epfl.ch**

We pursue an interdisciplinary research program at the interface of synthetic chemistry, supramolecular self-assembly, and materials science. Our research interests revolve around the intricate balance of order and disorder in materials as a tool to control structure formation on the supramolecular, nanoscopic, or microscopic length scale.

**Jan Van Herle**
**GEM**
**gem.epfl.ch**

Our Group performs R & D on fuel cells and electrolysis, concentrating on solid oxide technology (600-800°C) to convert hydrocarbons (natural gas, biofuels) into electricity and heat (gas-to-cogeneration) and convert excess electricity and waste heat into fuel (power-to-gas).

**Jean-Philippe Thiran**
**LTS5**
**lts5www.epfl.ch**

Image analysis : image registration, image segmentation, object detection and tracking, behavioural models, including facial image analysis and eye tracking
Medical image anaylsis : Diffusion MR image analysis: from raw data to global brain connectivity analysis
Ultrasound imaging: advanced acquisition and reconstruction of 2D and 3D ultrasound images
Multimodal signal processing

**Juergen Brugger**
**STI-IMT-LMIS1**
**lmis1.epfl.ch**

The rapid development of sensor networks for wearables and IoT impose new demands for sustainable and maintenance-free micro power sources. State of the art R&D focuses on piezoelectric nanogenerator (PENG) and triboelectric nanogenerator (TENG) that have instantaneous energy conversion efficiency and advantageous performance at low frequency over classical electromagnetic generator. For example, a triboelectric energy harvesting system, composed of TENG and micro supercapacitor (MSC), can simultaneously generate and store energy needed to drive the system. To bridge the energy harvesting and storage components, a power management circuit is integrated in the system, which can provide a reliable direct current (DC) source for sustainably driving/charging various commercial electronics.

**Mario Paolone**
**DESL**
**desl-pwrs.epfl.ch**

The research activities of the Distributed Electrical Systems Laboratory refer to the development of smart grid concept solutions in order to efficiently deliver sustainable, economic and secure electricity supply. These solutions aim to integrate intelligently the actions of all users connected to the electrical network whatever they are generators or consumers. They rely on innovative products and services together with intelligent monitoring, control, communication and self-healing.

**Martin Gijs**
**LMIS2**
**lmis2.epfl.ch**

The LMIS2 has as mission the development of new microfabrication technologies and to exploit these for applications of industrial interest. We are doing multidisciplinary research in the fields of design, simulation, fabrication, integration and application of microsystems.

**Michele Ceriotti**
**COSMO**
**cosmo.epfl.ch**

At the Laboratory of Computational Science and Modeling we strive to obtain quantitative predictions on the behavior of materials and chemical compounds by simulating matter at the atomic scale, reproducing on a computer the motion of atoms and molecules. We develop new modelling techniques to accelerate simulations, and use machine learning algorithms to obtain fast and accurate predictions of materials' properties, as well as to support our intuitive understanding of the underlying physical-chemical processes.

**Nicola Marzari**
**THEOS**
**theossrv1.epfl.ch**

Our research is dedicated to the development and application of computational modeling to outstanding problems in materials science, mainly using quantum-mechanical descriptions of interacting electrons and nuclei that are verified and validated against experimental results and higher-order theories. This computational laboratory allows to characterize or predict materials' properties directly from first-principles simulations, to screen or design new materials and devices with high-throughput calculations, and to connect microscopic and atomistic structure to macroscopic performance.

**Niels Quack**
**Photonic Micro- and Nanosystems**
**q-lab.epfl.ch**

The research group on Photonic Micro- and Nanosystems at EPFL focuses on engineering innovative photonic and optoelectronic systems with extraordinary performance. Utilizing microsystems fabrication technologies, the group investigates Optical Micro-Electro-Mechanical Systems (MEMS) and Photonic Integrated Circuits (PICs), such as low loss fiber-optical switches, tunable infrared sensors or optical beam steering mechanisms for imaging solutions. By virtue of their small size and reduced power consumption, these advancements in technology contribute to energy efficiency in consumer electronics and in infrastructure for secure optical telecommunications.

**Olivier Martin**
**NAM**
**nam.epfl.ch**

We are working on plasmonics, the optics of metallic nanostructures. We pursue a very comprehensive research that includes modelling, nanofabrication and optical characterization. Applications of our work include the development of novel biosensing techniques, nonlinear plasmonics, optical metamaterials, as well as the fundamental properties of plasmonic nanostructures.

**Patrik Hoffmann**
**LPMAT**
**lpmat.epfl.ch**

We are researching novel materials and enabling technologies for integrated optics. Our current focus is on the fabrication and patterning processes of thin films of oxide optical materials.

**Paul Bowen**
**Powder Technology Group at Laboratory of Construction Materials**
**https://lmc.epfl.ch/page-154501-en-html/**

PTG has as its goals the understanding at a fundamental level these various steps with a view to improving the materials properties of technological importance and to contribute in the development of new and intelligent materials. The current focus of research is on calcium silicate hydrates and calcium phosphates for both construction and biomedical applications.

**Roland Logé**
**LMTM**
**lmtm.epfl.ch**

The Laboratory of Thermomechanical Metallurgy (LMTM) and PX Group Chair is involved in the development of advanced manufacturing processes such as 3D printing for metals, which promotes a significant reduction of the amount of raw materials needed to fabricate metallic components as well as the recycling of the unused material. 3D printing also introduces new designs with hollow, lighter-weight lattice structures and components, which decrease the "energy burden." (SG 12)The laboratory also develops new manufacturing methods or conditions leading to improved material properties, smart behaviors and increased lifetimes (SG 9, 12).

**Romain Fleury**
**Laboratory of Wave Engineering**
**lwe.epfl.ch**

We focus on unveiling the mechanisms that govern wave propagation in complex artificial media, and apply our science to tackle challenging applicative problems.

**Sophia Haussener**
**LRESE**
**lrese.epfl.ch**

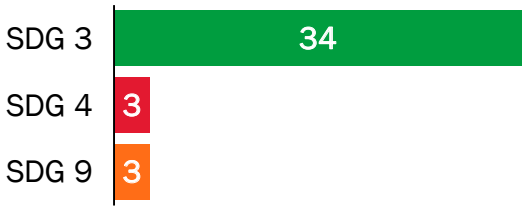
The mission of LRESE is to develop science and technology for efficient, inexpensive, sustainable, and durable approaches for renewable energy conversion. Particularly, we focus on solar energy – given its exceptional potential – and its conversion in storable, high energy density fuels. We formulate novel and sustainable energy conversion pathways, use advanced multi-physical and multi-scale modeling tools and experimentation to demonstrate the approach and design functional prototypes, optimize the approaches, and provide pathways for scaling. Our research and technology development is broadly embedded into life cycle assessment and techno-economic investigations and optimizations.

**Veronique Michaud**
**Laboratory for Processing of Advanced Composites (LPAC)**
**lpac.epfl.ch**

The laboratory for processing of advanced composites focuses on the fundamentals of composite and hybrid materials processing, in view of cost-effective and environmentally sustainable functional materials and structures. Targeted applications are in the transport, energy, sport and bio-medical fields. Relevant topics to the sustainable development goals are linked to health and wellbeing (SDG3, projects on prostheses and low power new-born incubators), responsible consumption and production (SDG 12, bio-based composites, efficient production of composites, nanostructures surfaces for waste reduction), climate action (SDG13, light weight structures, integration of solar panels, use od recycled materials).

# SV

**SV** – School of Life Sciences




**36** labs on **8** different SDGs in total

**Alexandre Persat**
**P-LAB**
**p-lab.science**

We are interested in determining how bacteria respond to the mechanics of their environments, such as fluid flow and contact with different surfaces. We try to understand how such system provides these organisms with selective advantages in the wild, be it in colonization or virulence. Finally, we aim at developing alternative therapeutic strategies that target mechano-sensitive systems to combat infections.

**Andrea Ablasser**
**UPABLASSER**
**ablasserlab.epfl.ch**

Our research focuses on the identification of factors involved in the intracellular recognition of pathogen-derived molecular patterns and on the elucidation of the consecutive signaling events. We also aim towards a better understanding of the physiological functions of these pathways both in the context of pathogen infection and during non-infectious, physiological processes.

**Brian McCabe**
**UPMCCABE**
**mccabelab.epfl.ch**

The research in our laboratory is directed towards understanding the neuronal networks and the interconnecting synapses that comprise the sensory-motor system. Motor circuits are fundamental for complex animal life and are thought to be among the most ancient of neuronal assemblies. Disruption of motor system function, such as in humans by neurogenetic diseases like amyotrophic lateral sclerosis (ALS) and spinal muscular atrophy (SMA), have devastating consequences for afflicted individuals.

**Bruno Lemaitre**
**UPLEM**
**lemaitrelab.epfl.ch**

Insects possess efficient mechanisms for detecting and neutralising microbial infection. The application of Drosophila genetics to deciphering these mechanisms has generated insights into insect immunity and uncovered similarities with mammalian innate immune responses. Our research focuses on understanding mechanisms of microbial infection and corresponding host defence responses in Drosophila using genetic and genomic approaches.

**Carlotta Guiducci**
**Laboratory of Life Sciences Electronics**
**clse.epfl.ch**

The lab fosters individualized medicine, contributing with innovative analytical systems to be employed in biomedical research, in clinical laboratories and to be used directly at the patient's side.

**Carmen SANDI**
**Laboratory of Behavioral Genetics**
**lgc.epfl.ch**

The Laboratory of Behavioral Genetics investigates the impact and mechanisms whereby stress and personality affect brain function and behavior, with a focus on the cognitive, emotional and social domains. Specifically, we investigate: 1) The neurobiological mechanisms involved in behavior and cognition, and their modulation by stress and anxiety. 2) The mechanisms whereby stress enhances risk to develop psychopathologies, including anxiety, depression and pathological aggression. 3) The role of brain metabolism in brain function and behavior, and the possibility of modulating these functions through nutrition and neurofeedback approaches. We perform work in animal models and in humans.

**Cathrin Brisken**
**UPBRI**
**brisken-lab.epfl.ch**

Our goal is to understand how hormones interact with developmental signaling pathways in the breast to control growth and differentiation and how they contribute to breast cancer development. We seek to translate the insights into novel approaches to prevent and treat breast cancer.

**Daniel Constam**
**UPCDA**
**constam-lab.epfl.ch**

We use genetic and biochemical approaches to decipher molecular mechanisms that coordinate growth and differentiation of cells and tissues during normal development and in cancer. A current focus is on live imaging of proprotein convertases and their roles in regulating TGFβ-related activities and other specific signaling pathways in tumour cells and in their microenvironment. We also study the regulation of mRNA translation and cell metabolism by the RNA-binding protein Bicc1 and specific interacting factors. Mutations in Bicc1 randomize visceral left-right asymmetry and instigate cystic growth in the kidney and pancreas. Identifying upstream regulators and relevant downstream targets of Bicc1 will shed light on the etiology of polycystic kidney diseases.

**David Suter**
**Sponsored Stem Cells Research Chair**
**suter-lab.epfl.ch**

Embryonic stem (ES) cells are derived from the inner cell mass of the embryo at the blastocyst stage. They can be maintained in culture and instructed to differentiate towards virtually any cell type of the body, thereby providing a powerful tool to study developmental processes in vitro. In addition, they are a promising source for future cell therapy applications, which aim at replacing cells lost in pathological conditions such as Parkinson's disease, myocardial infarction, diabetes, and other major human diseases.

**Deplancke**
**UPDEPLA**
**deplanckelab.epfl.ch**

The general interest of my Lab is the generation of novel experimental and computational approaches to study 1) how the genome steers the development of specific cell types, and 2) how variation in this genome makes each of us different. For this, we are developing microfluidic, high-throughput sequencing, single cell genomics, large-scale yeast screens, and computational approaches to specifically study the transcriptional mechanisms underlying metabolically relevant cell types such as fat cells and to investigate the genetic basis of metabolic variation such as obesity and diabetes.

**Didier Trono**
**LVG**
**tronolab.epfl.ch**

Our laboratory has had a long-standing interest for interactions between viruses and their hosts. This led us in the past to study the biology of pathogens such as human immunodeficiency virus and hepatitis B virus, and to develop virus-based delivery systems for human gene therapy. Over the last ten years, our research has shifted towards the field of epigenetics, to explore the impact of retroelements and their controlling mechanisms on the development and physiology of higher organisms, including humans. Of particular interest to us is the so-called KRAB'n'KAP system, which comprises some 400 KRAB-containing zinc finger proteins (KRAB-ZFPs) and their cofactor KAP1, and evolved from a line of defense against retroelements to a true master regulator of mammalian physiology.

**Douglas Hanahan**
**CMSO**
**hanahan-lab.epfl.ch**

The Hanahan group investigates tumor development and progression using genetically engineered mouse models of cancer that recapitulate important characteristics of human cancers, with strategic goals to elucidate pathogenic mechanisms underlying multi-step tumorigenesis and malignant progression, and to develop new therapeutic strategies based on knowledge of mechanism for translation to clinical trials aiming to improve the treatment of human cancers. Currently the lab focuses on melanoma, glioblastoma, pancreatic cancer, and squamous carcinomas elicited by human papillomaviruses.

**Elisa Oricchio**
**UPORICCHIO**
**oricchiolab.epfl.ch**

Research in Oricchio Laboratory focuses on the genetics of lymphoma and its translation into new therapies. We combine genomic analyses of human tumors with functional in vivo studies to assess the role of genetic lesions in tumorigenesis, disease progression, and relapse under treatment.

**Etienne Meylan**
**UPMEYLAN**
**meylan-lab.epfl.ch**

Research in Oricchio Laboratory focuses on the genetics of lymphoma and its translation into We are studying the mechanisms that govern the development of non-small cell lung cancer (NSCLC). To this end, we use a combination of bioinformatics analyses, cancer-derived mouse and human cell lines, tumor tissue material and genetically-engineered mouse models of human NSCLC.

**Freddy Radtke**
**UPRAD**
**radtke-lab.epfl.ch**

The chair of cellular differentiation and cancer has a long-standing track record to study the molecular mechanisms controlling self-renewal and differentiation of normal and cancer stem cells in the blood system as well as in epithelial tissues including the intestine and the epidermis. These processes have to be under stringent control mechanisms to ensure life-long tissue homeostasis and their deregulation can lead to organ failure and/or cancer. The general concept is that a better understanding of the mechanisms controlling stem maintenance versus differentiation may lead to the identification of novel therapeutic targets, as well as improving strategies to manipulate these players during tumorigenesis. We aim to translate our basic scientific findings into therapeutic approaches with the goal to bring them to the clinics for the benefit of cancer patients.

**Gisou van der Goot**
**VDG**
**vdg.epfl.ch**

The lab is performing research in the fields of molecular and cellular understanding of bacterial toxins, the organization of mammalian membranes and in organelles biology.

**Gregoire Courtine**
**Courtine Lab**
**courtine-lab.epfl.ch**

We develop neurotechnologies to restore sensorimotor functions after neurological disorders, especially spinal cord injury, Parkinson's disease and stroke.

These neurotechnologies involve the development of next-generation neuromodulation therapies. Contrary to conventional approaches that deliver continuous trains of unspecific electrical stimulation, our interventions are modulated in the spatial and temporal domains—hence the term Neuromodulation 2.0.

Moreover, we introduce these neuromodulation therapies during neurorehabilitation in order to augment nervous system reorganization; and combine these strategies with neural repair interventions to further improve neurological recovery.

**Hilal Lashuel**
**Laboratory of molecular and chemical biology of Neurodegeneration**
**lashuel-lab.epfl.ch**

Research in the Lashuel laboratory focuses on applying integrated chemical, biophysical, and molecular/cellular biology approaches to elucidate the molecular and structural basis of protein misfolding and aggregation and the mechanisms by which these processes contribute to the pathogenesis of neurodegenerative diseases including Parkinson's disease (PD), Alzheimer's disease (AD),Huntington's disease (HD) and Amytrophic Lateral Sclerosis (ALS).

**Jacques Fellay**
**GR-FE**
**fellay-lab.epfl.ch**

Our lab focuses on human genomics of viral diseases. Using a range of large-scale approaches, we explore the genetic roots of inter-individual differences in response to viral infections. Strategies include genome-wide genotyping and association analysis, exome sequencing and transcriptomics. The integration of multiple layers of "-omic" data and the study of genetic interactions between viral pathogens and their human hosts represent particularly exciting aspects of our research.

At the crossroad between basic science and the clinical world, we are committed to translational genomic research, aiming at identifying, validating, and bringing to clinical use genetic markers of susceptibility to infectious diseases.

**Joachim Lingner**
**UPLINGNER**
**lingner-lab.epfl.ch**

Our laboratory combines telomeric chromatin analysis by mass spectrometry, biochemistry and molecular genetics to study the dynamics of telomere structure, function and replication in human cells under normal and pathological situations. Our work may allow manipulation of telomere functions in tumors and other diseased tissues in the future.

**Joerg Huelsken**
**UPHUELSKEN**
**huelsken-lab.epfl.ch**

The lab investigates mechanistic and therapeutic implications of the Cancer Stem Cell concept, seeking to identify targetable mechanisms of cancer progression. New approaches of immunotherapy are currently developed which aim to eradicate established tumors by elimination of Cancer Stem Cells and immune check point blockade. Furthermore, in the last couple of years a focus has been the development of new therapeutics based on drug screens, therapeutic antibodies and antibody drug conjugates isolated and produced in the lab.

**Johannes Gräff**
**Laboratory of**
**Prof. Johannes Gräff**
**graefflab.epfl.ch**

Our lab is interested in three main questions. How and where are long-term memories stored in the brain? Why are memories lost during neurodegeneration such as in Alzheimer's Disease? How can traumatic memories from the past be overcome?

**John McKinney**
**LMIC**
**mckinney-lab.epfl.ch**

Research in the Laboratory of Microbiology and Microtechnology (LMIC) is focused on the quantitative dynamics of microbial behavior in fluctuating environments. Our principal research tools are time-lapse optical (fluorescence) and atomic force microscopy. We collaborate with colleagues in EPFL's School of Engineering to design, construct, and apply new microfluidic and microelectromechanical technologies for real-time single-cell microbiology

**Jolles-Haeberli**
**Swiss BioMotion Lab**
**chuv.ch/fr/dal/dal-home/research/swiss-biomotion-lab/**

The Swiss BioMotion Lab (SBML) aims to improve understanding, prevention and treatment of joint pathologies.Multidisciplinary research combining mechanical, structural, biological, and quality of life data is conducted to improve fundamental understanding of musculoskeletal pathologies. The Lab values a translational approach where knowledge gathered at the fundamental level are used to improve therapeutic options and inversely, where clinical experience is used to guide fundamental research. Our research uses various technologies, such as biomechanical modeling and biomedical imaging, to study different factors of a pathology together. The SBML is very active in the development of novel diagnosis and monitoring tools.

**Kristina Schoonjans**
**Laboratory of Metabolic Signaling**
**schoojans-lab.epfl.ch**

By investigating the molecular basis by which metabolites in general, and bile acids in particular, signal to convey adaptive responses in metabolic organs, our laboratory aims to identify novel mechanisms and strategies to target metabolic disorders.

**Marcel Salathé**
**Digital Epidemiology Lab**
**salathelab.epfl.ch**

The Digital Epidemiology Lab at EPFL studies the effect of the digital transformation on healthcare systems. A special focus is on epidemiology, and how the widespread use of mobile and online technology, in combination with methodological advances in machine learning, can be leveraged to build better health systems. Our data sources are online social media, and big data sets obtained from mobile apps. The vast majority of our work is applying machine learning and artificial intelligence, without which our work would be impossible.

**Melanie Blokesch**
**Laboratory of Molecular Microbiology**
**blokesch-lab.epfl.ch**

The Blokesch laboratory studies the ecology and evolution of bacteria with an emphasis on pathogen emergence. In this context, the focus lies primarily on the causative agent of the severe diarrheal disease cholera. Cholera as an infectious disease that sickens up to 4 million people and over 100'000 patients die of the disease every year. The cholera-causing bacteria are primarily transmitted by contaminated water. Understanding the environmental lifestyle of the bacterium in its natural aquatic habitats is therefore of prime importance and the goal of our research. Overall, our work is therefore linked to human health, clean water, changing climate, and life below water.

**Michael Herzog**
**LPSY**
**lpsy.epfl.ch**

In the Laboratory of Psychophysics, we investigate visual information processing in human observers with psychophysical methods, TMS, EEG, and mathematical modelling.Main topics of research are: feature integration, contextual modulation, time course of information processing, and perceptual learning. In clinical studies, deficits of visual information processing are investigated in schizophrenic patients.

**Michele De Palma**
**UPDEPALMA**
**depalma-lab.epfl.ch**

Our laboratory investigates the interactions between genetically altered cancer cells and the ostensibly normal host tissues in which tumors arise, progress and develop to metastatic disease. We focus on the cross talk between malignant cells and the vascular system, immune cells, and secreted extracellular vesicles (exosomes), and the mechanisms whereby these heterotypic interactions regulate tumor progression in experimental cancer models. Furthermore, we examine how the interplay between the tumor and the host can be harnessed for improving tumor response to anti-cancer therapies.

**Olaf Blanke**
**LNCO**
**lnco.epfl.ch**

The Bertarelli Chair in Cognitive Neuroprosthetics has two main missions: the neuroscience of consciousness and neuroprosthetics including human augmentation. In neuroscience, we target the brain mechanisms of body perception and self-consciousness by combining psychophysical and cognitive paradigms with neuroimaging techniques and engineering-based approaches such as virtual reality, robotics, and vestibular stimulation. In our pioneering research in cognitive neuroprosthetics, we designed robotic devices for diagnostics in neurological and psychiatric patients suffering from hallucinations and other alterations of consciousness. We have developed a new line of technologies called immersive digiceuticals and tested their therapeutic efficacy in several chronic pain conditions.

**Olaia Naveiras**
**GR-NAVEIRAS**
**naveiras-lab.epfl.ch**

The research focus of our lab is to understand the regulation of the reversible transition between yellow bone marrow (adipocyitic) to red bone marrow (hematopoietic). Reducing the toxicity of the preparative regimen and accelerating the time to engraftment is critical to improving the safety of bone marrow transplantation.

**Oliver Hantschel**
**UPHAN**
**hantschel-lab.epfl.ch**

The group studies signaling mechanisms and novel treatment strategies for haematological malignancies

**Patrick Aebischer**
**Neurodegenerative Disease Laboratory**
**len.epfl.ch**

Tackling neurodegenerative diseases thus represents a formidable challenge for our ageing society. A first axis of our research is focused on the development of rodent models to improve our understanding of the molecular basis of neurodegenerative diseases such as Parkinson's disease (PD), Alzheimer's disease (AD) and Motoneuron diseases (i.e. amyotrophic lateral sclerosis (ALS) and spino-muscular atrophy (SMA)). On the other hand, we are developing gene therapy strategies aimed at correcting gene defects or treating its consequences, especially for gene deletion-based genetic disorders. To that purpose, we are using two distinct gene therapy approaches to deliver candidate genes in animal models of the diseases: (i) the encapsulation of genetically engineered cell lines releasing the therapeutic molecules (ex vivo gene therapy) and (ii) direct in vivo viral vector delivery (in vivo gene therapy).

**Philipp Bucher**
**GR-BUCHER**
**bucher-lab.epfl.ch**

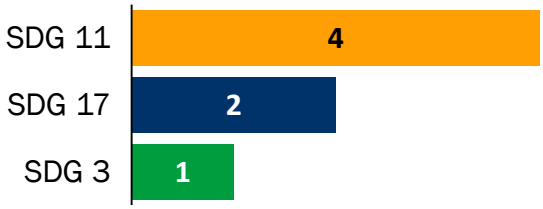
Genome sequencing projects and new high-throughput technologies are producing large amounts of biological data that are potentially relevant to cancer. Our group contributes to the analysis of these data by developing new methods and database resources related to genome structure and gene regulation. In addition, we apply computational approaches to specific questions about transcriptional regulation. In particular, we try to identify and characterize transcriptional control mechanisms distorted in cancer cells by analyzing public data.

**Viesturs Simanis**
**Simanis Lab**
**simanis-lab.epfl.ch**

All cells arise by division. Failure to coordinate cell cycle events properly and execute them with high fidelity can lead to death of the progeny of a division event, or alterations of the genome which can contribute to the genesis of tumours. We use a simple model system to study how cell division (cytokinesis) is coordinated with chromosome segregation (mitosis).

# CDH

**CDH** – College of Humanities




**4** labs on **3** different SDGs in total

**Daniel Gatica-Perez**
**Idiap laboratory at EPFL**
**idiap.epfl.ch**

Our activities encompass basic research, training, and technology transfer activities in the area of Artificial Intelligence for Society including, among others, multimedia information management, human-computer interaction, perceptual and cognitive systems, natural language processing and understanding, social media, biometric person recognition, multimodal information interfaces, applied artificial intelligence (AI) and large-scale machine learning.

**Frédéric Kaplan**
**Digital Humanities Laboratory DHLAB**
**dhlab.epfl.ch**

The Digital Humanities Laboratory develops new computational approaches for rediscovering the past and anticipating the future. The projects conducted at the lab range from the reconstruction of ancient cities to the algorithms influence in writing. The Venice Time Machine is the DHLAB flagship project, in partnership with Ca' Foscari University. It aspires to digitize 1000 years of historical records and make them accessible. The DHLAB trains a new generation of digital humanists, developing innovative educational programs as well as didactic technologies.

**Martin Rohrmeier**
**Digital and Cognitive Musicology Lab DCML**
**dcml.epfl.ch**

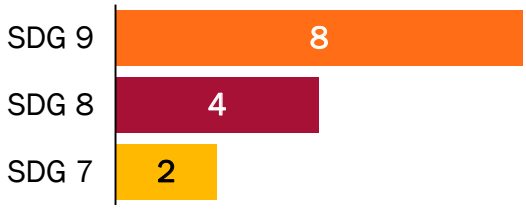
Music is a ubiquitous phenomenon across cultures around the world. Why does music play such an important role in human life? What are the underlying cognitive structures? How did they evolve? What are the musical features and processes shared between various genres, historical styles, and cultures? How did musical universals emerge? How can modern methods and innovations such as self-learning algorithms help to better understand this highly complex system? At the DCML we are devoted to exploring music from cognitive, computational, musicological, and psychological perspectives, bringing together modern algorithmic methods, corpus research, music-theoretical expertise, and experimental approaches.

**Sarah Kenderdine**
**Laboratory for Experimental Museology EMPLUS**
**emplus.epfl.ch**

eM+ is a new transdisciplinary initiative at the intersection of immersive visualisation technologies, visual analytics, aesthetics and cultural (big) data. eM+ engages in research from scientific, artistic and humanistic perspectives and promotes post-cinematic multisensory engagement using experimental platforms. eM+ works on tangible and intangible heritage and archival materials from many countries including Asia, Australasia and Europe. The lab also creates high-fidelity data in-the-field through a range of state-of-the-art techniques. eM+ transforms this burgeoning world of cultural data into advanced ultra- high resolution visualisation through advanced computer science and HCI.

# CDM

**CDM** – College of Management of Technology




**10** labs on **12** different SDGs in total

**Christopher Tucci**
**Chair of Corporate Strategy & Innovation**
**csi.epfl.ch**

The Chair of Corporate Strategy & Innovation is a research laboratory established at EPFL in 2003 to promote scholarship in the area of technology and innovation management (TIM). CSI is focused on issues of corporate strategy and innovation, or how large, multi-business firms manage transitions to new technologies, business models, and organizational forms.

**Daniel Kuhn**
**Chair of Risk Analytics and Optimization (RAO)**
**rao.epfl.ch/research/**

A broad spectrum of very diverse resource allocation and decision problems arising in public infrastructure investment planning, power systems operation, supply chain management, production planning, fleet management, traffic planning, network design, economics, risk management, health care, project management, telecommunications, cloud computing, process control, etc. are naturally formulated as mathematical optimization problems. Most if not all of these optimization problems share the following key attributes.

**Dominique Foray**
**Chair of Economics and Management of Innovation (CEMI)**
**cemi.epfl.ch**

The Chair of Economics and Management of Innovation is a research laboratory led by Prof. Dominique Foray to develop teaching and research in the area of economics and management of innovation, knowledge and technology. As a research team, CEMI strongly believes that effective measures for the promotion of long term economic growth and development through innovation should be based on our understanding of how innovation is generated, distributed and exploited by several actors in the economy. We hope that our research can shed some light on the various aspects of the economics of innovation both in advanced and less developed economies.

**Gaetan de Rassenfosse**
**IIPP**
**iipp.epfl.ch**

The Chair seeks to provide sound empirical evidence on questions relevant to science, technology and innovation policy. It has developed a strong expertise in economic considerations related to national education policy (SDG 4), the financing of clean tech with a focus on new ventures (SDG 7), and the policy tools that best support innovation (SDG 9), in particular intellectual property. Through its involvement in these various areas, the overarching objective of the Chair is to understand the policy features that help sustain economic growth (SDG 8).

**Kenneth A. Younge**
**Chair of Technology & Innovation Strategy (TIS)**
**tis.epfl.ch**

TIS uses methods from data science and econometrics to investigate technology and innovation strategy. We focus on topics such as intellectual property, inventor mobility, competitive pressure, and decision making, with a specialization on clean technology and drug discovery. We work with scientists across several fields, including economics, strategic management, statistics, and computer science.

**Luisa Lambertini**
**Chair of International Finance**
**cfi.epfl.ch**

Research at CFI focuses on the analysis of monetary and fiscal policies within models that represent the whole economy with several markets, such as goods markets, labor markets, financial markets and housing markets. These models – referred to as general equilibrium macroeconomic models – are fundamental to capture the interaction among different markets, the propagation of shocks, the effect of macroeconomic policies and their welfare implications. Such interactions are the reason why an unanticipated event in one market may trigger a crisis in another market and affect the overall economy.

**Marc Gruber**
**ENTC**
**entc.epfl.ch**

The Chair of Entrepreneurship and Technology Commercialization (ENTC) is engaged in several interrelated research activities in the field of entrepreneurship, innovation, and strategy. The chair's research areas address topics of high practical relevance and impact, most notably: necessity entrepreneurship, i.e. firms that are founded by unemployed individuals who chose to become self-employed by starting a new firm (SDG 1, 8), sustainable entrepreneurship, i.e. start-ups focused on inclusive growth by creating economic, social, and ecological value simultaneously (SDG 8), as well as community entrepreneurship, i.e. local communities adopting collective entrepreneurial solutions by cooperatively taking over or re-establishing local businesses (SDG 11).

**Matthias Finger**
**MIR**
**mir.epfl.ch**

The Chair Management of Network Industries (MIR) studies the de- and re-regulation, as well as the governance and the management of the different network industries, namely postal services, telecommunications, electricity, water distribution and sanitation, railways, as well as air transport. We focus especially on the role the Information and Communication Technologies (ICTs) play in governing and transforming these industries. As of recently, we have extended our activities to the governance of large urban infrastructure systems.

**Ralf Seifert**
**CDM-MTEI-TOM**
**tom.epfl.ch**

The Chair of Technology & Operations Management (TOM) is focused on issues of Technology & Operations Management which arise in technology-based enterprise with regard to new product introductions, operation and supply chain management, and the management of technology standards.

**Thomas Weber**
**Operations, Economics and Strategy (OES)**
**oes.epfl.ch**

The mission of OES within the MTEI is to conduct world-class research and teaching at the intersection of operations, economics and strategy, as it relates to organizations and their interactions.

# Research Centers

**Blue Brain Project**

**Prof. Henry Markram**
**bluebrain.epfl.ch**

The goal of the Blue Brain Project is to build biologically detailed digital reconstructions and simulations of the rodent, and ultimately the human brain. Understanding the brain is vital, not just to understand the biological mechanisms which give us our thoughts and emotions and which make us human, but for practical reasons. Understanding how the brain processes information can make a fundamental contribution to the development of new computing technology – neurorobotics and neuromorphic computing. More important still, understanding the brain is essential to understanding, diagnosing and treating brain diseases that are imposing a rapidly increasing burden on the world's ageing populations.

**Center for Biomedical Engineering**

**Prof. Rolf Gruetter**
**cibm.ch**

The mission of the CIBM is to advance biomedical imaging and its applications while addressing biomedical questions of importance. This is accomplished by establishing a research network in imaging science to enhance biomedical research capabilities of the founding institutions and beyond, as well as within CIBM.

**Center for Digital Education**

**Patrick Jermann**
**moocs.epfl.ch**

In order to consolidate the competence and know-how in MOOCs-related matters and to develop MOOCs technologies and practices, EPFL opened EPFL Center for Digital Education on April 1st 2013. The center aims to foster the adoption of MOOCs both within EPFL and by partners of EPFL. The center missions are to produce MOOCs for EPFL and its partners; to operate MOOC-based educational programs; to carry out research activities on the use of digital technologies in education and training.

**Center for Neuroprosthetics**

**Prof Stéphanie Lacour**
**cnp.epfl.ch**

In partnership with the Bertarelli Foundation, the Defitech Foundation, the International Foundation for Paraplegia Research and Medtronic, the EPFL is creating a large world-class Center for Neuroprosthetics. With ever progressing advances in biotechnology, microelectronics, and neural implants as well as unprecedented advances in our understanding of the brain and spinal cord, the Center's mission is to define and establish a truly interdisciplinary area of study, merging neuroscience with engineering and medicine, and efficiently translating major breakthroughs from bioengineering and neuroscience to viable clinic applications.

**Cooperation and Development Center**

**Prof. Jean-Claude Bolay**
**cooperation.epfl.ch**

The Cooperation and Development Centre at EPFL (CODEV) promotes innovative technologies to support social, environmental and economic development in the Global South. It supports impact-oriented research projects in partnership with researchers from the Global South. CODEV offers courses in development engineering and sustainable development to undergraduate and graduate students at EPFL. The mission of CODEV is to develop and promote technological innovations that can address global challenges and contribute to shift this world on a more sustainable path.

**EcoCloud**

**Prof. Babak Falsafi**
**ecocloud.ch**

EcoCloud is one and only academic center of its kind enabling eco-friendly smart data through resilient, efficient, secure and trustworthy data platforms. Our mission is to provide world-class leadership for, and to drive innovation in, resilient, efficient, secure and trustworthy data platforms and technologies. In so doing, we aim to address the major national and global IT challenges that affect us all.

**Energy Center**

**Yasmine Calisesi**
**cen.epfl.ch**

The mission of the Energy Center (CEN) is to catalyse energy research led by EPFL laboratories, notably in collaboration with industrial and institutional partners, and enhance EPFL's impact and image as a world leading research and education institution contributing to the transition towards a sustainable energy future.

**EPFL+ECAL Lab**

**Nicolas Henchoz**
**epfl-ecal-lab.ch**

Exploring the potential of emerging technologies through design, the EPFL+ECAL Lab tackles the challenges linked to new technologies by combining artistic creativity, and scientific knowledge in order to transform technical performance into user experience. For instance, the Solidarity Network explores how digital technology can improve social connections in real life and gives guidelines to design user-friendly interfaces for seniors - an inclusive approach that benefits all generations.

**Essential Tech**

**Klaus Schönenberger**
**essentialtech.center**

Essential Tech Center focuses on technology innovation for development and humanitarian action. Its goal is to develop essential technologies that have the potential to reduce poverty and vulnerability. Its approach combines technology development with the elaboration of innovative business models for a sustainable and large-scale impact. We work mostly in low income settings as well as in humanitarian contexts, where the scarcity in quality infrastructure, in financial resources, in qualified personnel, together with extreme environmental conditions, create a challenging environment for technologies.

**Food and Nutrition Center**

**Christian Schwab**
**nutritioncenter.epfl.ch**

The mission of the IFNC is to act as interface between EPFL and the outside business actors and foster the transfer of relevant science and technologies to help the industry address the major societal and environmental challenges associated to food & nutrition. To this effect, the IFNC is spanning various domains from fundamental research to Health Sciences, from IT to Management. One critical pilar of the IFNC activity is to foster the development of start-ups and entrepreneurs, and by extension of the entire innovation ecosystem around food & nutrition

**Habitat Research Center**

**Paola Viganò**
**habitat.epfl.ch**

Habitat Research Center is a trans-disciplinary research platform. Its aim is to explore the urban phenomena and to produce visions, strategies and projects on this primary and crucial topic. HABITAT aims to position itself at the frontier of the urban phenomena assuming the future as a "research habit" to link Academia and Society and explores the ecological, technological and social transition in the urban space. The research approach is based on three working hypotheses: inhabiting; the city territory as a renawable resource; how to live together: a new biopolitical project

**Initiative for Media Innovation**

**Mounir Krichane**
**media-initiative.ch**

The IMI is a consortium of academic, public and private partners that was created in January 2018 in an effort to support and develop innovation in the media sector, both through information technology and in relation to human and social sciences. Topics of interest include fake news, content recommendation and personalization, conversational interfaces, immersive experiences, artificial intelligence, and also new business models, as well as the cultural and social aspects of media.

**International Risk Governance Center**

**Marie-Valentine Florin**
**irgc.epfl.ch**

In 2016 EPFL established the transdisciplinary International Risk Governance Center (IRGC) with the objective of strengthening the university's expertise in the understanding of emerging and systemic risks as well as the governance of opportunities and risks associated with new technologies, and to reinforce its collaboration with policy. IRGC contributes a risk governance approach to EPFL activities, focusing on how risks can be governed without stifling innovation.

**Limnology Center**

**Prof. Alfred Wüest**
**limnc.epfl.ch**

The science of limnology was described as" the oceanography of lakes" by François-Alfonse Forel in 1892, who was famous for his early investigations of Lake Geneva. Limnology nowadays refers to the study of freshwaters, including lakes, rivers and marshes. The EPFL limnology center has the following goals: to create interdisciplinary innovative and international projects in limnology; to federate research among different departments of EPFL; to promote the collaboration between international and national research institutions on lakes; and to develop and apply new technologies in limnology.

**MetaMedia Center**

**Alain Dufaux**
**metamedia.epfl.ch**

The Metamedia Center is a multidisciplinary and transversal center created in 2010 at EPFL. Its goal is to digitize and preserve the entire audiovisual collection of the Montreux Jazz Festival. From the first edition of the Montreux Jazz Festival in 1967 its visionary founder, Claude Nobs, recorded the performances of artists unaware that his legacy would become, in 2013, the first audiovisual collection to be inscribed in the Memory of the world UNESCO register as one of the most important testimonial to the history of music covering Jazz, Blues and Rock.

**Nano-Tera**

**Martin Rajman**
**nano-tera.ch**

The Nano-Tera initiative aims to bring Switzerland to the forefront of a new technological revolution: using engineering and information technology to improve health and security, and to broaden our management of energy and the environment. The goals are, for example, to detect in real time different health risks and conditions through body-integrated bio probing, to reveal security risks through smart buildings and environments, to save energy through ambient sensing, and to detect and monitor environmental hazards such as floods and avalanches from inaccessible positions on earth.

**National Centre of Competence in Research (NCCR) Robotics**

**Prof. Dario Floreano**
**nccr-robotics.ch**

The NCCR Robotics aims to develop new, human oriented robotic technology for improving our quality of life. NCCR Robotics promotes three main strands of research: Wearable robots - we work with neurologists and physicians to truly understand the human body and nervous system so that robots are attuned to the needs of the wearer. Rescue robots - we develop new types of flying, walking, and swimming robots that are portable and safe for humans, and could be used for instance in disaster areas. Education: We are designing new modular and reconfigurable robots fitted with sensors and actuators to provide an effective and affordable tool for teaching in schools and universities.

**Swiss Polar Institute**

**Danièle Rod**
**polar.epfl.ch**

The Swiss Polar Institute (SPI) is a new interdisciplinary center devoted to researching the Earth's poles and other extreme environments. The SPI aims to enhance the Swiss scientific, economic and diplomatic contribution to understanding and solving global challenges such as climate and environmental changes and management of global resources through cutting-edge science and technology. The SPI thus strives to bundle Swiss research in polar and other extreme environments (Alpine and Extreme Ecosystems and Landscapes, Lakes, Glaciers and Water Systems, Planets) with cutting edge technological developments such as: space technologies; satellites; remote sensing and data processing; drones; robotics; sensors for environmental monitoring; big-data handling; renewable energy; health monitoring.

**Swiss Space Center**

**Volker Gass**
**spacecenter.ch**

The Swiss Space Center contributes to the implementation of the Swiss Space Policy. It provides a service supporting academic institutions, RTOs and industry to access space missions and related applications, and promote interaction between these stakeholders. Its main tasks are: to network Swiss research institutions and industries on national and international levels in order to establish focused areas of excellence internationally recognized for both space R&D and applications; to facilitate access to and implementation of space projects for Swiss research institutions and industries for established actors as well as for newcomers; to provide education and training; to promote public awareness of space.

**Transportation Center**

**Prof. Michel Bierlaire**
**transport.epfl.ch**

Initiated in 2009, the Transportation Center of the EPFL (TRACE) is an interdisciplinary center with the primary mission to become the interface between EPFL and the outside world for all topics related to transport and mobility of people and goods. The transport sector is of a deeply transversal nature, which is why TRACE gathers actors from a broad range of disciplines to develop multidisciplinary research of high caliber in order to bring added-value solutions to societal problems.

# EPFL Spinoffs

| | | | |
|---|---|---|---|
| abionic | abionic.com | info@abionic.com | 2010 |
| Aesyra | aesyra.com | info@aesyra.com | 2017 |
| Akselos | akselos.com | | 2012 |
| Aleva | aleva-neuro.com | info@aleva-neuro.com | 2008 |
| Amazentis | amazentis.com | contact@amazentis.com | 2007 |
| Anokion | anokion.com | info@anokion.com | 2011 |
| ithetis | ithetis.com | info@ithetis.com | 2008 |
| Aurora's Grid | aurorasgrid.com | dimitri.torregrossa @aurorasgrid.com | 2016 |
| Bestmile | bestmile.com | | 2014 |
| Bloom Biorenewables | bloombiorenewables .com | | 2018 |
| Bright Sensors | bright-sensors.com | | 2014 |
| Candlelight systems | candlelight-systems .com | contact @candlelight-systems.com | 2018 |
| Cellestia Biotech | cellestia.com | | 2014 |
| Daphne Technology | daphnetechnology .com | info@daphnetechnology.com | 2018 |
| DistalMotion SA | distalmotion.com | info@distalmotion.com | 2012 |
| Astrocast | astrocast.com | | 2014 |
| Embion Technologies | embiontech.com /technology | info@embiontech.com | 2016 |

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| Enairys Powertech | enairys.com/en | | 2008 | 7 13 |
| EssentialMed | essentialmed.org | info@essentialmed.org | 2013 | 3 10 |
| Fastree 3D | fastree3d.com | info@fastree3d.com | 2013 | 9 |
| Flyability | flyability.com | | 2014 | 9 |
| Fondation iM4TB | im4tb.org | info@im4tb.org | 2014 | 3 10 17 |
| Gaiasens | gaiasens.ch | | 2010 | 13 15 |
| Gait up | gaitup.com | contact@gaitup.com | 2013 | 3 |
| Gamaya | gamaya.com | | 2015 | 14 |
| Genomsys | genomsys.com | | 2016 | 3 |
| Gliapharm | gliapharm.com | info@gliapharm.com | 2016 | 3 |
| GRidSTeer | gridsteer.ch | | 2018 | 7 11 |
| GTX medical | gtxmedical.com | | 2015 | 3 |
| Hydromea | | | | 14 |
| Insolight | insolight.ch | info@insolight.ch | 2016 | 7 11 13 |
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| Kaemco | kaemco.ch | info@kaemco.ch | 2014 | 11 12 13 |
| Komp - act | komp-act.com | salvatore.debenedictis @komp-act.com | 2018 | 9 13 |
| Lucentix | lucentix.ch | | 2015 | 3 |
| Lumendo | lumendo.ch | info@lumendo.ch | 2018 | 3 |

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| Lunaphore | lunaphore.ch | | 2015 |
| Lymphatica | lymphatica.ch | contact@lymphatica.ch | 2014 |
| Medusoil | medusoil.com | | 2018 |
| Mindmaze | mindmaze.com | | 2012 |
| MIRobotics | mirobotics.ch | | |
| Mobsya | mobsya.org | info@mobsya.org | 2010 |
| Motilis | motilis.com/V3 | contact@motilis.com | 2006 |
| Nanogence Global | linked.com/company /nanogence-global | | 2017 |
| Nanolive | nanolive.ch | | 2013 |
| Oculight Dynamics | oculightdynamics.com | contact@oculightdynamics.com | 2018 |
| Picterra | picterra.ch | | 2016 |
| Pix4d | pix4d.com | | 2011 |
| Pristem | pristem.com | info@pristem.com | 2015 |
| Resistell | resistell.com | | 2018 |
| Rheon Medical | rheonmedical.com | | 2010 |
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| SmartCardia | smartcardia.com | smartcardia.com/#contact | 2013 | |
| SonoView Acoustic | sono-view.com | contact@sono-view.com | 2010 | |
| Sun Bioscience | sunbioscience.ch | info@sunbioscience.ch | 2009 | |
| Swiss-Inso | swissinso.com | nicolas.jolissaint @swissinso.com | 2016 | |
| Technis | mytechnis.com | info@mytechnis.com | 2016 | |
| TwentyGreen | twentygreen.com | hello@twentygreen.com | 2015 | |
| Volumina Medical | volumina-medical.ch | contact@volumina-medical.ch | 2018 | |
| Xsensio | xsensio.com | | 2014 | |
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