EPFL in figures 2021

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We believe that science and technology allow us to understand our world and contribute to make it better. We inspire and guide future generations of technological leaders in order to develop tangible solutions to shape a better world for all together. This is achieved through promoting, sharing and transferring knowledge, by training technological and responsible leaders and by developing and supporting meaningful innovation.

EPFL's vision

List of abbreviations

AdG	ERC Advanced Grants
ARWU	Academic Ranking of World Universities (also known as the Shanghai ranking)
BBP	Blue Brain Project
C4DT	Center for Digital Trust
CDM	EPFL College of Management of Technology
CERN	European Organization for Nuclear Research
CNCI	Category Normalised Citation Impact
CoG	ERC Consolidator Grants
COS	EPFL Certificate of Open Studies
COVID-19	Pandemic of coronavirus disease 2019
CSEM	Centre Suisse d'Électronique et de Microtechnique in Neuchâtel
CTI	Commission française des titres d'ingénieurs
DLL	EPFL Discovery Learning Lab
DRIL	EPFL Digital Resources for Instruction and Learning
EAWAG	Swiss Federal Institute of Aquatic Science and Technology
ECTS	European Credit Transfer and Accumulation System
EMPA	Swiss Federal Laboratories for Materials Science and Technology
ENIT	National School of Engineering of Tunis
ESRF	European Synchrotron Radiation Facility
FCBG	Campus Biotech Foundation in Geneva
FCUE	UNIL-EPFL Continuing Education
H2020	8th European framework program funding research, technology, and innovation
HEdA	Swiss Higher Education Act
IC	EPFL School of Computer and Communication Sciences
IDIAP	Fondation Dalle Molle d'Intelligence Artificielle Perceptive in Martigny
IMD	International Institute for Management Development
ITER	International Thermonuclear Experimental Reactor
MINT	Mathematics, Computer Science, Natural Science and Technology
NCCR	The SNF National Centres of Competence in Research
ORD	Open Research Data
PHRT	Personalized Health and Related Technologies
PSI	Paul Scherrer Institute
RESCIF	Network of Excellence in Engineering Sciences of the French-speaking Community
SAS	Swiss Accreditation Service
SCCER	Swiss Competence Center for Energy Research
SCITAS	EPFL Scientific Computing resources and High Performance Computing
SDSC	Swiss Data Science Center
SEFRI	State Secretariat for Education, Research and Innovation
SFA	ETH Domain Strategic Focus Areas
SHS	EPFL Social and Human Sciences Program
SMS	Swiss MOOC Service
SNSF	The Swiss National Science Foundation
SPE	EPFL Education Outreach Department
SPHN	Swiss Personalized Health Network
SPI	Swiss Polar Institute
SSCC	Swiss Support Center for Cybersecurity
StG	ERC Starting Grants
Swiss TPH	Swiss Tropical and Public Health Institute in Basel.
TCV	Variable Configuration Tokamak
THE	Times Higher Education
TUM	Technical University Munich
WSL	Swiss Federal Institute for Forest, Snow and Landscape Research

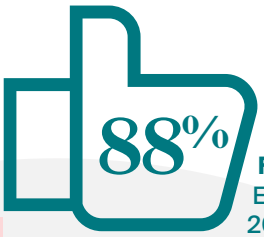
1. EDUCATION IN FIGURES

EPFL aims to offer an educational program of excellence, meeting the needs of a society facing major upheavals. Despite the disruption caused by the COVID-19 pandemic, EPFL still set important new objectives for its overall strategy.

With **12'720 students** enrolled, EPFL's curricula are clearly appealing. In particular, the number of students involved in cross-disciplinary projects increased by 65%, from 600 to around 1'000. New joint initiatives with other Swiss institutions were rolled out in 2021; these included a joint PhD program with ETH Zurich and a new joint Master's in Sustainable Management and Technology with the University of Lausanne (UNIL) and the International Institute for Management Development (IMD).

The COVID-19 pandemic has made clear what is essential in teaching and learning. Students and teachers often report that what they miss the most is being physically present together in the classroom. This sense of loss reflects students' need for frequent, high-quality feedback from their teachers, and teachers' need for feedback from students. It also highlights the importance of tutoring and mentoring to support student engagement throughout the semester, and the value of working in small groups, which gives students the opportunity to ask questions and receive timely answers. One positive side effect of the pandemic has been greater thought and discussion about how to support these core elements of teaching and learning. It has also been a formidable accelerator for the use of digital tools in education. The ongoing challenge is to ensure EPFL does not use these tools to simply "transmit knowledge" more effectively, but also to facilitate effective feedback, two-way communication, and cooperation.

88%
EMPLOYABILITY RATE IN CH



88% **OF SATISFACTION FOR CLASSES** EVALUATED IN 2020

1'175
MASTERS DELIVERED
+80% IN TEN YEARS

MAGISTRALE 2021

182'953
CERTIFICATES OF ATTENDANCE ISSUED TO MOOC PARTICIPANTS

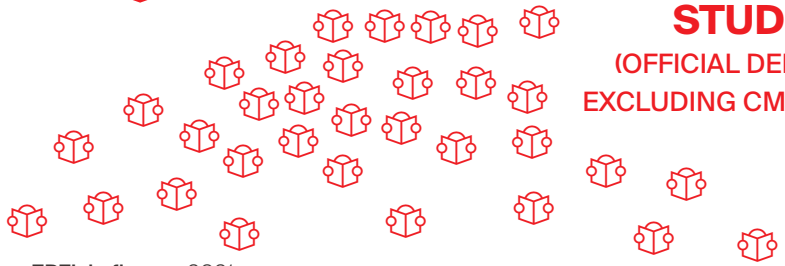
2'407
PHD STUDENTS
+22% IN 10 YEARS

3'708
MASTER STUDENTS
+89% IN 10 YEARS

6'428
BACHELOR STUDENTS
+47% IN 10 YEARS

177
MAS/CAS STUDENTS OF WHICH 37% WOMEN

12'720
STUDENTS
(OFFICIAL DEFINITION EXCLUDING CMS & CAS)



30.2%
OF STUDENTS ARE **WOMEN**
+3% IN 10 YEARS

1.1. Innovations in the field of education

Since 2018, EPFL has been developing and implementing a new strategy for innovative education, based on three pillars:

1. The **CORE initiative** which builds polytechnical skills through new teaching methods. In line with this approach, the Propaedeutic Center (CePro) was opened in 2021 to harmonize and coordinate teaching across core first-year classes in information, computational and communication science (ICC), mathematics and physics. The goal is to ensure that all future engineering graduates have solid foundations in these core subjects. CePro's role includes training teaching assistants, supporting teachers as they conduct classes and exams, and providing resources to first-year students so they can get their university studies off to a good start. CePro also serves as a bridge between teachers giving classes in other sections and the sections themselves, and helps to make sure that the sections are provided with the support they need.

   The DRIL (Digital Resources for Instruction and Learning) Fund[1] helps teachers create digital resources for education, with two calls for proposals each year rather than one, so that students can get quicker feedback.

   With Jupyter Notebooks[2], students can acquire computational-thinking skills and learn how to apply methods from computer science to solve problems in all disciplines. The notebooks can be accessed through a centralized online platform, which enables classes with more than 200 students to run simulations simultaneously using a simple web browser. In 2021, there were over 3'200 users of this service (an increase of more than 20% from 2020).

   The Learning Companion is an online service that allows students to assess their study skills and, in doing so, become more independent learners. The Companion includes a journaling exercise in which students describe the challenges they face in solving problems, and teachers and teaching assistants can in turn view these challenges in the Companion and address them in a subsequent lecture. This service is designed to help students transition from high school to university.

   The Learning Companion is included in a starter kit that is provided to all first-year Bachelor's students. This starter kit also contains two handbooks (Apprendre à étudier and Savoir-faire en mathématique, currently available in French only) as well as access to a MOOC on study methods (Apprendre à étudier, currently available in French only) and a series of in-person workshops.

   As part of the efforts to support students in their first year, EPFL rolled out a mentorship program in 2021 whereby experienced students mentor cohorts of first-year students. The need for such a program became especially clear in 2020, during the

1 http://go.epfl.ch/dril
2 http://go.epfl.ch/notebooks

pandemic, in order to help students struggling with their studies. Mentors are employed by the sections and given mentorship training.
Also in 2021, EPFL introduced a mandatory teach-the-teacher program for teaching assistants working on core first-year classes. Teaching assistants who are also first-year PhD students can earn ECTS credits for the program.

The Campus Analytics[3] project puts the power of data science to work for education. In 2021, all the lectures that professors recorded for students taking classes remotely or through a hybrid approach were indexed automatically and can be found by searching the EPFL Graph knowledge base[4]. This project is now being expanded from a research prototype to a university-wide service in order to provide fresh insight into the areas of education, research and innovation.

2. The **MAKE initiative**, which was introduced in 2019 to support lab experiments and cross-disciplinary projects involving students from different fields. These projects are supplemented by sustained efforts to incorporate project-based learning into every part of the curriculum, and to give students more opportunities to take part in entrepreneurial activities, summer-school programs and associations. Special facilities for these projects are available to students through the Discovery Learning Labs (DLL), which include rooms and equipment as well as coordinators and experts to guide students.

In 2021, around 700 students were involved in a total of 16 MAKE projects, with seven new topics. Based on the project proposals submitted from 2021 to the beginning of 2022, the number of students is expected to increase to approximately 1'000. Four of the new project proposals directly address a sustainability-related issue.

EPFL aims to enhance students' learning experience in these projects by providing training on teaching methods to PhD students who supervise MAKE projects and to the students who carry out the projects. In addition, all MAKE participants must take a micro-ethics workshop where they learn how to identify and handle discrimination and harassment issues in project teams. In 2021, a group of EPFL researchers published a book titled Facilitating Experiential Learning in Higher Education: Teaching and Supervising in Labs, Fieldwork, Studios and Projects.

Work on new DLL programs to fill identified gaps is ongoing; these include the Mechanical Prototyping and Electronics DLL, the Molecular DLL (scheduled to open in 2025) and the Structural Prototyping DLL (opening date TBD).

3. The **LEARN Center**, which focuses on translational research in education. The goal is to develop new teaching methods, in particular by using the vast amount of data produced by online education. The Center has conducted various projects on innovative teaching, based on its translational research approach. There is ongoing work on project-based learning and on the incorporation of cross-cutting and

3 https://campusanalytics.epfl.ch/
4 https://graphsearch.epfl.ch

professional skills into the curriculum. In 2021, the Center, in association with EPFL's College of Management, submitted a proposal to the LEGO foundation to explore the potential of using tangible objects to develop cross-functional management skills. This research project will proceed under the MAKE initiative.

EPFL's faculty have supported a rapid transition to different ways of learning that were compatible with the health and safety guidelines imposed by the COVID-19 pandemic. The School was able to hold the winter exam session in early 2021 using a mixture of take-home, remote-oral, and on-site exams, and the spring 2021 semester was held largely in a flexible manner: one third of students were on campus each day and classes were conducted either simultaneously on site and online or in a flipped format. Despite some challenges, this flexible approach proved successful. For more information, visit https://go.epfl.ch/flexible-teaching.

In addition to the three initiatives discussed above, the Associate Vice Presidency for Education set four teaching-related objectives in 2021 that will be achieved through the following four working groups:

- First-year working group: to evaluate new measures the institution can take to help students make the transition to EPFL.
- Hybrid-teaching working group: to assess teachers' and students' experience during the pandemic so hybrid teaching methods can be implemented more effectively.

EPFL continuously reviews its educational programs to keep abreast of the needs of students, society and the economy

At the start of the 2020 academic year, the Special Mathematics Course (CMS) was opened to students who hold a maturité qualification in order to help them make the transition from high school to EPFL. Despite being eligible to enroll directly in the first year of a Bachelor's program, 64 students took advantage of this preparatory class in 2021 (up from 45 in 2020), which should provide them with the solid foundation they need to embark on their studies at EPFL with confidence.

The MAN (mise à niveau) review course[5] was updated in 2021 to better serve the needs of the students who are required to take it (i.e., Bachelor's students who ended the first semester of their first year with a GPA below 3.5). The changes to the course were initially rolled out in a pilot phase where a series of optional classes were introduced and offered to students depending on which Bachelor's programs they are pursuing. The pilot phase was successful, and the changes were made permanent starting in the 2021–2022 school year.

All first-year engineering students now take Introduction to Computational Thinking, a special class that runs alongside their regular classes. EPFL has also enhanced coordination on artificial intelligence and machine learning subjects across sections.

In 2021, the College of Management of Technology (CDM) introduced a new Master's in Sustainable Management and Technology, in conjunction with UNIL and IMD. Thirty-two students are currently enrolled in this program.

5 https://www.epfl.ch/education/bachelor/fr/structure-des-etudes/man/

The Environmental Sciences and Engineering (SIE) section introduced a new minor in Sustainability in 2021.

EPFL will begin offering the following new Master's programs in September 2022:

- a Master's in statistics, given by the mathematics section
- a Master's in neurotechnology, given by SV, STI and IC
- a Master's in quantum science and technology, given by SB, IC and STI

The EPFL Doctoral School offers 22 PhD programs, several of which are truly cross-disciplinary, and is expanding the range of transferable-skills courses being offered.

1.2. EPFL works closely with other Swiss educational institutions

In 2021, EPFL introduced a new joint PhD in Learning Science program with ETH Zurich. The first students will begin in 2022. At the end of the program, they will be awarded a joint PhD degree (one certificate bearing both the EPFL and ETH Zurich logos).

Also in 2021, the Leading House DUAL-T: Technologies for Vocational Education research program was completed with the collective involvement of EPFL, the University of Fribourg and the Swiss Federal University for Vocational Education and Training. This program explored how to harness the potential of digital technology to bridge the skills gap between vocational training and workplace practices. As part of its efforts to support vocational education, the Swiss State Secretariat for Education, Research and Innovation (SERI) began funding the Digital VET Hub in 2020. A Digital Vocation, Education and Training Laboratory was opened in 2020 under this Hub.

EPFL has been working with UNIL for many years. EPFL's professors conduct classes for UNIL students through UNIL's College of Sciences, and UNIL professors run classes for EPFL students through its College of Humanities. The gateway program between EPFL's Bachelor's in Life Sciences Engineering and UNIL's Faculty of Biology and Medicine is still up and running. A fourth group of EPFL Bachelor's graduates went through this gateway program in the 2020–2021 school year (eight graduates took the UNIL entrance exam and four were admitted to the Faculty of Biology and Medicine). Spots for up to ten students have already been reserved for EPFL graduates for the 2022–2023 school year. EPFL also offers a gateway program for its Master's graduates with the University of Geneva's Faculty of Medicine; nine EPFL Master's graduates applied to the Faculty in 2021 of whom four were admitted.

Another way EPFL students and researchers can work with peers at other universities in French-speaking Switzerland is through EPFL's satellite campuses in the four French-speaking cantons.

EPFL puts its teaching and training expertise to work for society through joint initiatives with other universities and by interacting with institutions at all levels of the Swiss education and training system

NCCR Robotics and the LEARN Center are actively involved in coordinating national initiatives centered on the use of robotics in schools. The ROTECO.ch platform, set up with the support of the Swiss

Academies and SUPSI in Ticino Canton, is enabling a community of more than 400 teachers to share robotics activities, receive news, talk about their experience, and hold teacher training. Many institutions joined this initiative in 2021 and thus helped to expand its reach across the country. Today around 15 educational establishments are involved from all of Switzerland's linguistic regions.

1'500 teachers had been trained by end-2021

In 2020, the LEARN Center and the Education Outreach Department (SPE) continued their work on incorporating digital education into schools in Vaud. The LEARN Center is responsible for developing digital education focus areas in 12 pilot schools; in 2021, EPFL brought a further 17 pilot schools into this initiative. A total of 1'500 teachers had been trained by end-2021 (compared to 600 at end-2020). The Center is also leading a Vaud Canton initiative to develop materials for the new computer science curriculum for high schools.

In 2021, EPFL and the Canton of Bern set up a non-profit organization to create a new center, called BeLEARN, that will conduct translational research similar to that done by the LEARN Center. BeLEARN will be run in association with the Canton of Bern's three universities (Uni Bern, PH Bern and BFH) and the Swiss Federal University for Vocational Education and Training. The Canton of Bern has approved the funding for the project and EPFL's upper management has approved the agreement with the Canton. Work will begin in 2022. Seven EPFL projects in six different research laboratories have already been selected for BeLEARN.

EPFL is heavily involved in efforts to promote mathematics, computer science, natural science and technology (MINT) subjects and to ease students' transition from high school to university. The objective is to maintain consistency in the education provided across Switzerland and to consolidate EPFL's presence in the country's four language regions through targeted communication and awareness-raising campaigns in French, German, Italian and Romansh.

The Swiss EdTech Collider has grown into a community of more than 90 fledgling businesses. The incubator is also part of the BeLEARN initiative.

The Swiss MOOC Service (SMS) website (https://www.swissmooc.ch/) allows higher education institutions to give online classes hosted entirely in Switzerland. In 2021, EPFL and ETH Zurich jointly created the Swiss MOOC Service Association to support the website's development and operation. The association has entered into service agreements with five Swiss universities and the World Health Organization (WHO).

1.3. EPFL maintains its international reach

EPFL offers joint and dual degree programs with prestigious institutions including French Grandes Écoles, the Technical University of Munich (TUM) and Politecnico di Milano. EPFL's international reputation and appeal are further enhanced by its joint Master's programs with universities in Grenoble and Turin as well as with ETH Zurich.

The Doctoral School offers a variety of international and intersectoral exchange programs at the PhD level. For example, the

agreement for the joint supervision of PhD students within the EuroTech Universities Alliance was recently renewed and simplified.

Most summer school programs and research internships were given online or rescheduled in 2020 on account of the pandemic. These activities will resume when circumstances allow. In 2021, over 100 top research interns were able to come work at EPFL.

1.4. EPFL serves the community

The “Les sciences ça m’intéresse !” program developed by EPFL’s Science Outreach Department aims to introduce children to science and technology and to foster greater interest in, and understanding of, MINT subjects. In 2021, over 14’000 children aged 7–16 and 479 teachers took part in a wide range of MINT activities. These activities were carried out with classes from 13 Swiss cantons. In addition, over 4’500 children (77% girls) took part in extracurricular activities. The program has now been rolled out in all French-speaking and bilingual French-and-German-speaking cantons and in five German-speaking cantons. Nearly 3’000 children were able to enjoy activities in German and some activities were presented in Italian in Ticino. In 2021, new content was added to the program for girls aged 7–16, which was extended to new parts of the country. This program aims to get more girls interested in science, math, and information and communication technology, and to boost their knowledge and creativity in these subjects. The goal is to give girls more confidence in their capabilities and inspire them to become leaders in science and technology by introducing them to role models in MINT subjects, thus encouraging them to pursue degree programs and careers in these fields.

14’000

childrens aged 7-16 took part of the program «Les sciences ça m’intéresse!»

The School held a number of science-related events for the general public in 2021, including Scientastic, the EPFL science festival. Over 4,000 people attended last year’s Scientastic, although the number of attendees had to be restricted due to the pandemic.

1.5. Educational numbers

12’720 students were enrolled at EPFL in the fall of 2021, up 7.7% from 2020. At least half of the increase is due to COVID-19 related measures that extended the average length of students’ degree programs. The increase was seen at all levels: Bachelor’s, Master’s, PhD and continuing education.

The overall percentage of female students rose further in 2021, to 30%. The percentage of first-year female students is now nearly 33% and that of female continuing education students is 37%.

Mechanical engineering is the subject for which EPFL awarded the most Master’s degrees in 2021, followed by life sciences, architecture and computer science.

FIGURE 1
2011–2021 NUMBER OF STUDENTS ENROLLED AT EPFL (CEPF DEFINITION)

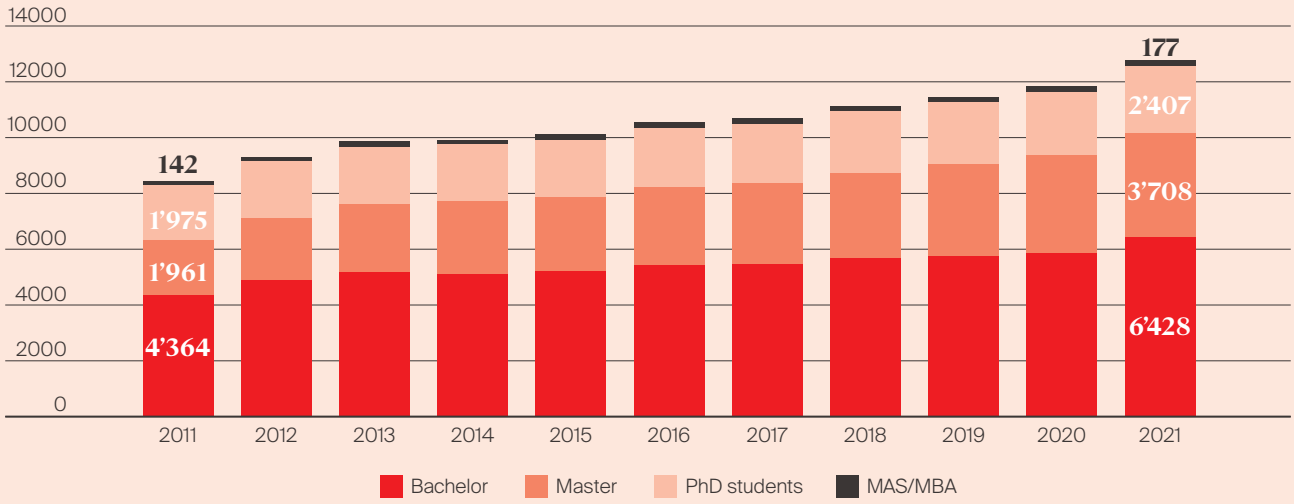
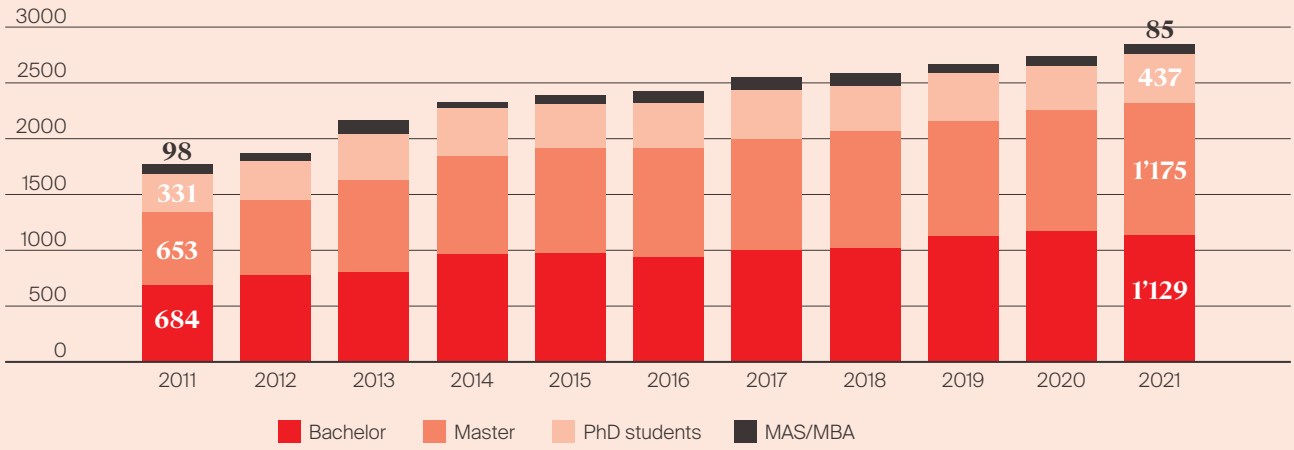


FIGURE 2
2011-2021 EVOLUTION OF EPFL NUMBER OF DEGREES DELIVERED



The number of Bachelor's and Master's degrees awarded since 2011 has increased by 65% and 80%, respectively, while the number of PhD degrees rose by 32%. With regard to continuing education, close to 100 Master's of Advanced Studies (MAS) diplomas were awarded in 2021, which is consistent with prior years, along with 33 Certificates of Advanced Studies (CAS); this brings the total number of continuing education qualifications awarded last year to 118.

High level of satisfaction among students and graduates

Indicative feedback was obtained from students for 627 courses in the spring 2021 semester and 641 courses in the fall 2021 semester. 14% of spring-semester courses were rated as "insufficient"; this figure dropped to 10% for the fall semester. This figure has been stable over the past three years. Some 57% of courses (n=722) had between 90% and

100% of students indicating they “agree” or “strongly agree” that the course was good.

As part of the system for evaluating degree cycles and programs, an alumni survey was conducted in 2021 to solicit feedback on how the graduates perceive the quality of their education at EPFL and on their subsequent career trajectory.

1.6. External workplace of PhD students

External workplace of PhD students

IDIAP	PSI	EMPA	CERN	CSEM	Eawag	MPI
39	34	26	18	12	6	6

Max Planck	WSL	HES	Other	Total
5	5	26	66	243

1.7. Acquiring skills for the workplace

Several initiatives were undertaken to help graduates acquire the necessary skills to transition into employment.

In-company internships – Since 2009, all EPFL Master’s students in engineering and architecture have had to complete an in-company internship. Companies posted 2’826 internship openings on EPFL’s website in 2021, and around 1’400 Master’s students started an in-company internship or thesis project. Host companies are very satisfied with their interns overall, with 98% students rated as “excellent” or “good.” The newly introduced “sustainable internship” label has also proven to be a success, with nearly 10% of all posted internships earning it in the first year.

EPFLglobaLeaders – This is a PhD fellowship program introduced in 2021 to train the next generation of sustainability leaders in science and technology. Nearly 1’000 applications were received for the 48 fellowships available under this program, demonstrating its timeliness and appeal to students. This program has received funding from the European Commission (H2020).

Minors – In order to promote cross-disciplinary approaches and improve graduates’ employability, students are allowed to add minors and specializations to their Master’s programs. Minors enable students to diversify their main curriculum by taking courses in cross-disciplinary fields for 30 ECTS credits. Specializations consist of groups of courses on a specific topic within a student’s main field of study.

150 exchange and joint-degree programs with institutions outside Switzerland

Exchange programs – With more than 150 exchange and joint-degree programs with institutions outside Switzerland,

EPFL offers a wide range of exchange destinations and enables students from partner institutions to come and study. EPFL students spent a combined 660 semesters studying at other universities in 2021 (spring 2021 and fall 2021–2022 semesters combined). Students from the world's top universities also came to EPFL (1'174 semesters combined). In 2021, 69 EPFL students spent a semester at ETH Zurich and 13 ETH Zurich students spent a semester at EPFL.

The first call for proposals for the new EPFL Doc.Mobility program was launched in 2021. This program, funded jointly by EPFL and swissuniversities, is open to EPFL PhD students wishing to complete a research stay abroad.

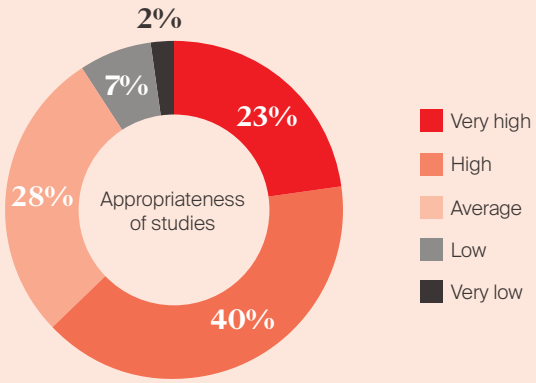
A new continuing education unit was formed in 2021 to further align educational programs with market needs and reach more learners in science and engineering.

1.8. EPFL graduate employment

Each year, an employment survey is conducted among EPFL alumni one year after their graduation, in order to make sure that the degree programs are aligned with the needs of the job market. The employment rate in Switzerland of EPFL's Master's graduates fell slightly, to 88.0% for the class of 2019 (down 3.3 percentage points versus the class of 2018). The 2019 data are the most recent available.

Satisfaction among the Master's graduates (i.e., how well their studies provided the skills required in their first job) is measured as part of this annual survey.

FIGURE 3
HOW WELL EPFL MASTER'S PROGRAMS PROVIDE GRADUATES WITH THE SKILLS REQUIRED IN THEIR FIRST JOB (2019 MASTER'S GRADUATES SURVEY)



For 2019 graduates, the satisfaction index was 3.75 out of 5 (1 = lowest, 5 = highest). Opinions were distributed as follows:

Continuing education

EPFL further expanded its continuing education programs in 2021. Despite the difficult circumstances caused by the pandemic, most of the programs were maintained through online and hybrid approaches, which are becoming increasingly attractive to learners in Switzerland and around the world.

In 2021, a total of 1'415 learners took part in the 38 continuing education programs currently offered. Six of these programs are given jointly with other Swiss universities (UNIL, the University of Geneva and ETH Zurich). The EMBA program is still the flagship continuing education program; it is Europe's longest-running Executive MBA program on innovation management. The participants who started in 2021 came from 14 different countries and 16 different industries.

Magistrale 2021
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A number of new continuing education programs were introduced in 2021, including:

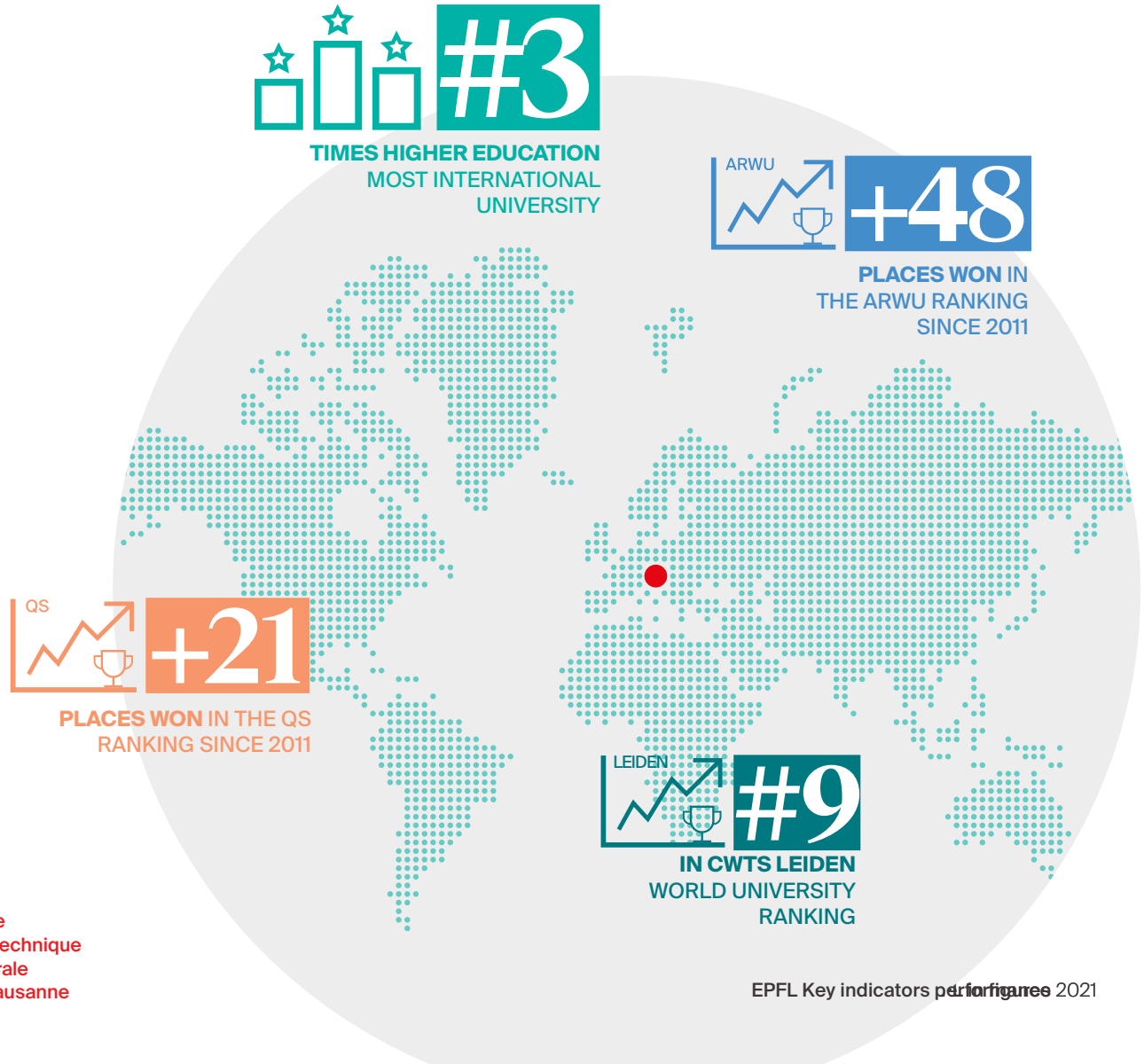
- A Master's of Advanced Studies (MAS) in Urban and Territorial Design, which EPFL developed and gives jointly with ETH Zurich as an annual 60-ECTS program.
- A short program titled Hazards and Risks of Chemicals, which already has 126 participants enrolled.
- A new Certificate of Open Studies (COS) program called Applied Data Science: Communication and Visualization, given by the EPFL Extension School.

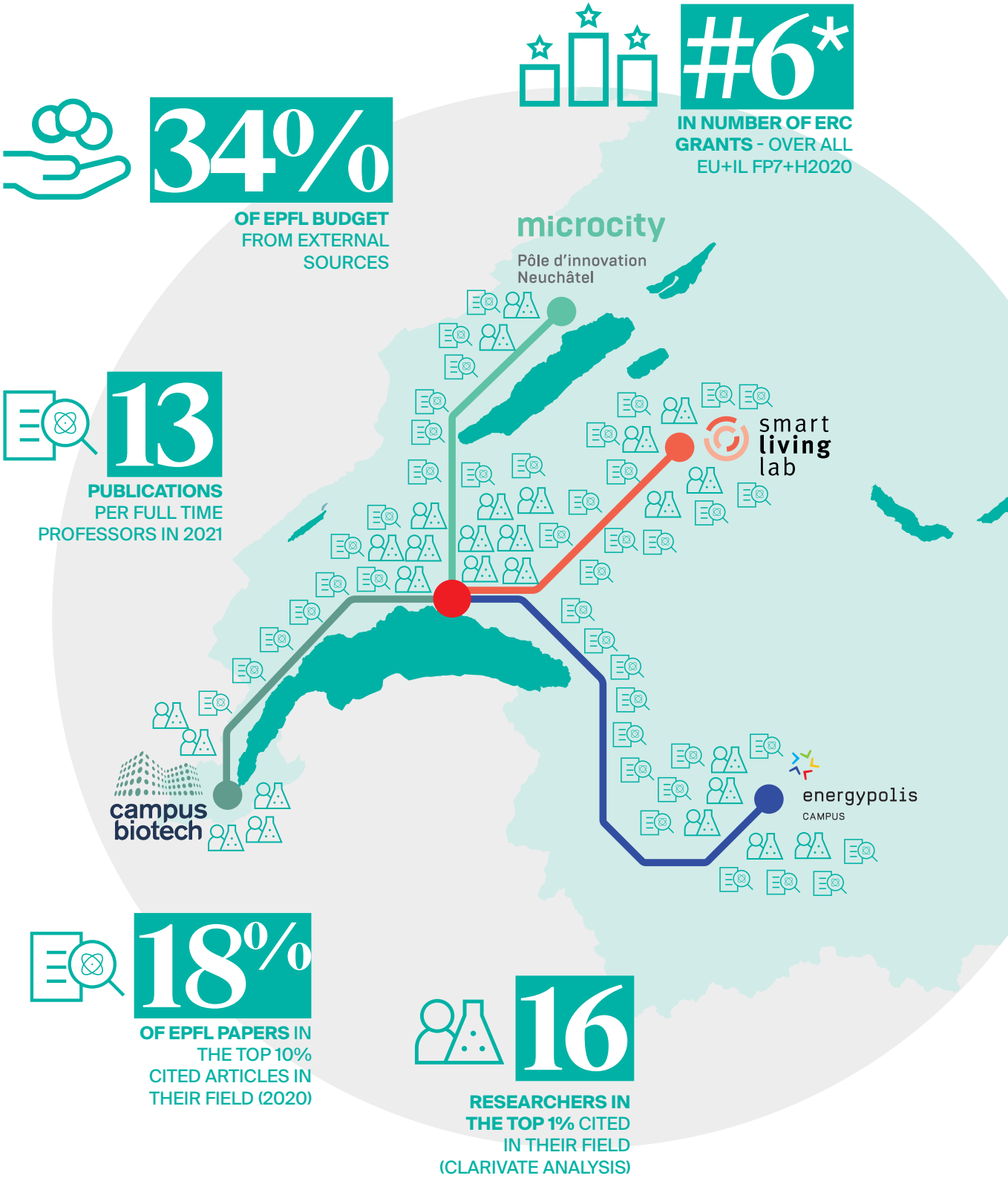
The EPFL Extension School continued to provide learners with digital technology courses, delivered fully online. Approximately 900 learners enrolled in its courses and programs in 2021. The Extension School delivered 146 COS certificates in 2021:

- 113 in Applied Data Science: Machine Learning
- 14 in Applied Data Science: Communication and Visualization
- 19 in Web Application Development.

2. RESEARCH IN FIGURES

In 2021, EPFL continued to face challenges not only due to the ongoing pandemic, but also the delayed start of Horizon Europe, the new EU framework, which was followed by Switzerland's unfortunate exclusion from many of the funding mechanisms. In spite of these challenges, the institution continued to conduct high level research and produce valuable publications. It pursues innovative approaches in transdisciplinary initiatives related to its declared fields of strategic importance and to those of the ETH Board. It brings students and researchers together to work on novel approaches to societal questions, all the while putting an accent on the implementation of promising technologies through partnerships and, notably, through start-ups and spin-offs.





* Rank No 6 in the total number of ERC grants excludes education networks such as CNRS and Max Planck.

The percentage of consolidated external revenue

EPFL has continued to be productive and innovative across many technical disciplines in science and engineering.

Excellence in the broad field of neuroscience continues to be a hallmark of the institution. The NeuroX initiative federates expertise in neuroscience (Brain Mind Institute), neurotechnology (Centre for Neuroprosthetics) and neurocomputation (Blue Brain Project) for both technology-driven neuroscience and neurotechnology for medicine and society.

The new joint EPFL-UNIL Dubochet Centre for imaging is a significant addition to EPFL's capacity to address questions related to imaging – from cutting-edge cryo-transmission electron microscopy instrumentation to software development for image acquisition, image storage and analysis, and data privacy. A new impetus is provided by the launch of the EPFL Imaging Center, which will provide significant cross-discipline collaboration in imaging science for fields as diverse as bio-image analysis, personalized medicine and space exploration.

Space is a field in which EPFL researchers and engineers are highly active. ClearSpace SA, a spin-off from EPFL's eSpace Centre, has been mandated by the European Space Agency to carry out the first-ever mission for eliminating debris in terrestrial orbit. Elsewhere, EPFL has joined the international Square Kilometre Array consortium and represents Switzerland in this global project to operate the largest radio-telescope ever built.

Affiliated to the University of Lausanne and the EPFL, the Center for Climate Impact and Action (CLIMACT), officially launched its activities in January 2021. CLIMACT seeks to promote integrated economic, social and environmental resilience by developing low-carbon pathways through continuous innovation in our social and ecological technical systems. The centre will create links between cultural, social and technological solutions, applicable from mountaintops to city centres in the areas of water, energy, health, land use, buildings and transport. EPFL has already commenced the new project EDGE (Enabling Decentralized renewable GEneration in the Swiss cities, midlands, and the Alps).

A new alliance addressing digital trust, Trust Valley, has brought together public, private and academic actors. So far, an accelerator programme designed for start-ups and a number of projects have been launched in agritech/agrifood.

EPFL has responded to the COVID-19 pandemic with initiatives addressing a range of facets of the outbreak, from bottom-up research in prevention, diagnostics and testing, cure and vaccines, to the application of IT technologies in the national tracing app. Several laboratories have contributed expertise to national ventures to pool resources for researchers and hospitals.

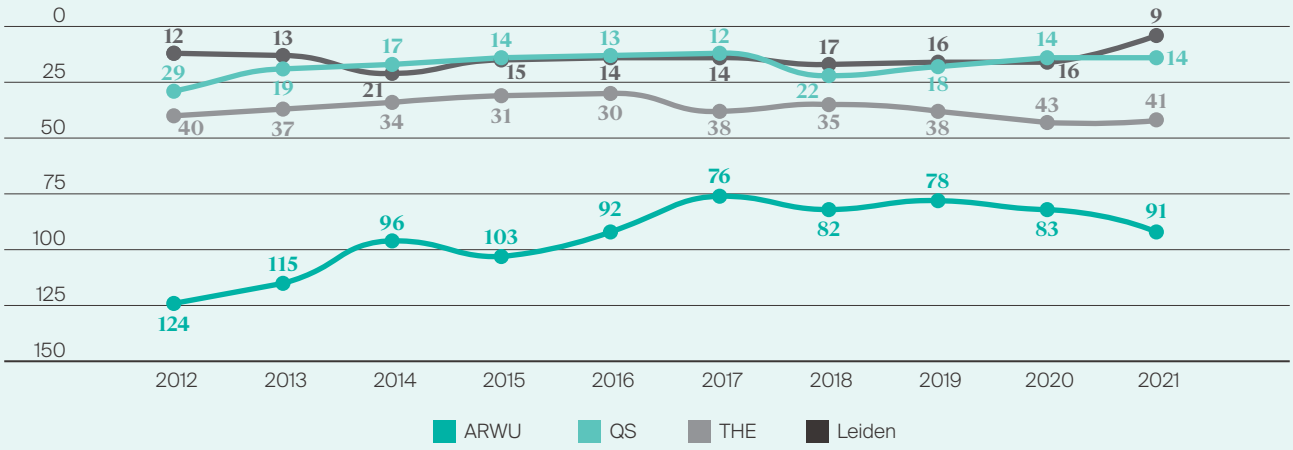
EPFL maintains a strong activity in raising funds from a range of external sources. The vision and dynamism of the institution's researchers is widely recognised, and their high success rates in ever-more competitive calls at both national and international level are a tribute to their reputation among a broad spectrum of peers and partner organisations.

2.1. EPFL's place in rankings

Academic league tables are controversial because they will never capture all the specifics of complex institutions such as Universities. It is therefore important to remind the reader of their limits and biases before exposing the performance of EPFL.

Nevertheless, EPFL has had a steady progression, identified as one of the most significant since the beginning of all major rankings. Between 2012 and 2021, EPFL gained 48 spots in ARWU World, 21 ranks in the QS World and has had a stable performance in THE and Leiden rankings (PP top 10%). EPFL managed to break into the top 10 in the Leiden ranking for the first time. In its core subjects (Science and Engineering), EPFL is consistently ranked as a world top 15 institution. In addition, Times Higher Education has named EPFL the 3rd most international university in the world in its most recent assessment.

FIGURE 4
2012-2021 SUMMARY OF EPFL'S PERFORMANCE IN ARWU, QS, THE AND LEIDEN (PP TOP 10%) RANKINGS



2.2. Bibliometric measures

EPFL's steady progression in several bibliometric indicators confirms its increasing and now well-recognized strength in research. The increase in number of publications and in the frequency of citation of these publications shows that its researchers publish successfully, not only in terms of quantity but also quality. In addition to the scientific benefit of knowledge sharing, these indicators provide quantifiable evidence of collaboration between institutions or between scientific domains. During the time window of 2011-2020, EPFL's annual total number of publications increased from 3'282 to 4'192, corresponding with an average of 13 annual publications per FTE professor.

The total number of publications indexed in 2020 was lower than the previous 5 years, but still a respectable amount. The decrease in 2020 was largely due to conferences that were cancelled due to the pandemic. The measured impact of EPFL's publications also significantly increased during the same period.

FIGURE 5
NUMBER OF PUBLICATIONS AUTHORED BY EPFL AND ETHZ (SOURCE: INCITES).

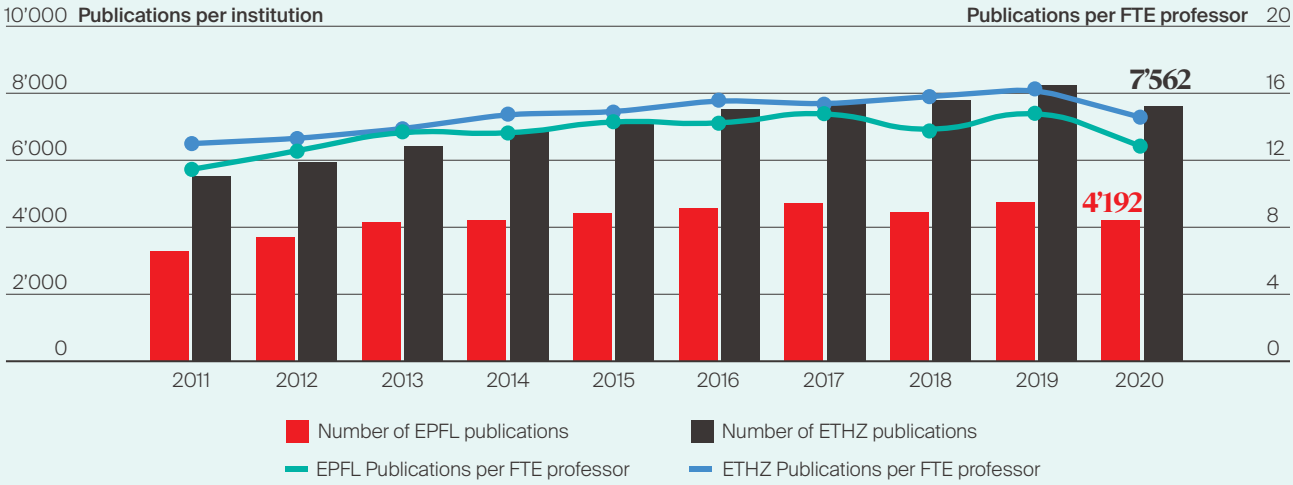
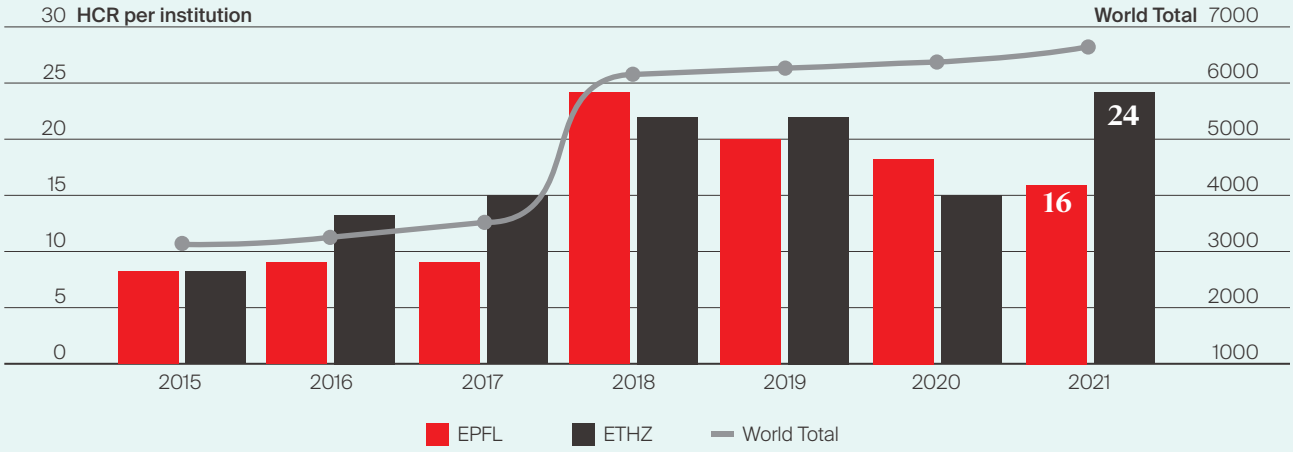


FIGURE 6
2015-2021 SUMMARY OF EPFL'S PERFORMANCE IN CLARIVATE HCR RESEARCHERS LIST (HCR.CLARIVATE.COM).



Clarivate Analytics publishes several indicators measuring the impact of institutions. In the most recent list of researchers with an exceptional impact factor (among the 1% most cited in their specific domain), the number of researchers working at EPFL as of the 2020 list is 16. This time EPFL has a lower count of highly-cited researchers (HCR) than ETH Zurich. Clarivate made some changes to the methodology of their list, which affected the outcome.

EPFL is very well represented among publications for which bibliometrics show a particularly large impact factor (situated among the 10% most cited). An analysis using the InCites Clarivate tool shows an over-proportional representation of very well-cited publications: 17.9% of EPFL publications from 2020 are situated among the 10% most-cited in their respective domains. ETHZ's score by this measure is 18.7% and the Swiss average is 15.6%.

EPFL's track record in attracting citations of its publications bears witness to its international impact and reputation.

FIGURE 7

THE CATEGORY NORMALISED CITATION IMPACT (CNCI) OF EPFL COMPARED WITH FOUR BENCHMARKS INCLUDING ETH ZURICH (SOURCE: INCITES). CNCI is calculated by dividing the actual count of citing items by the expected citation rate for documents of the same type, year of publication and subject area, and is a commonly used indicator).

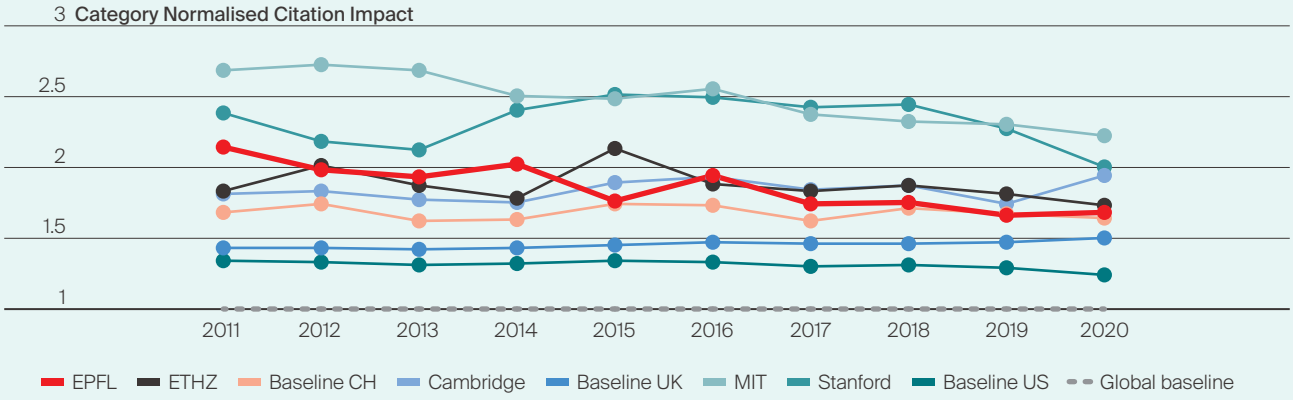


FIGURE 8

THE PROPORTION OF EPFL'S AND OTHER INSTITUTIONS' (INCLUDING ETH ZURICH) PUBLICATIONS THAT, COMPARED WITH OTHER PUBLICATIONS IN THE SAME FIELD AND IN THE SAME YEAR, BELONG TO THE TOP 10% MOST FREQUENTLY CITED (SOURCE: INCITES).

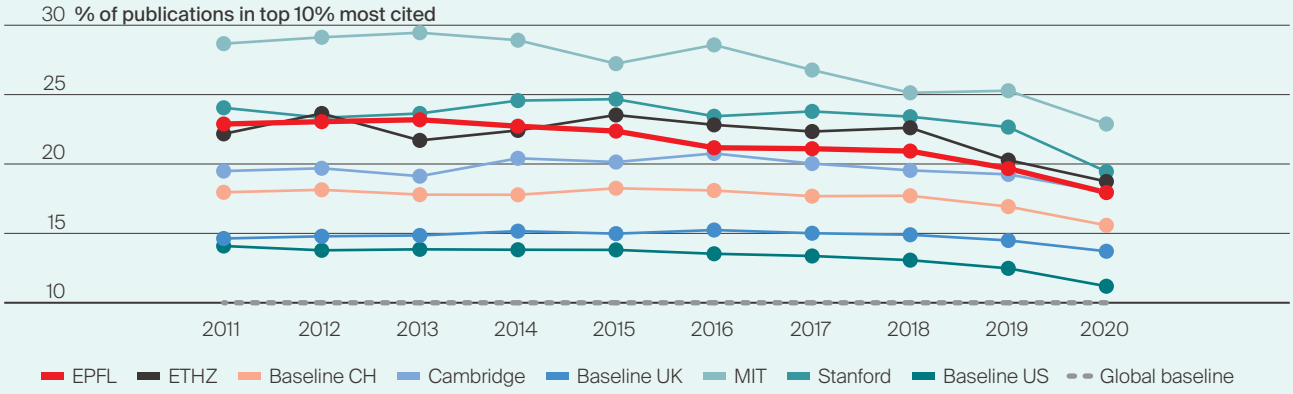
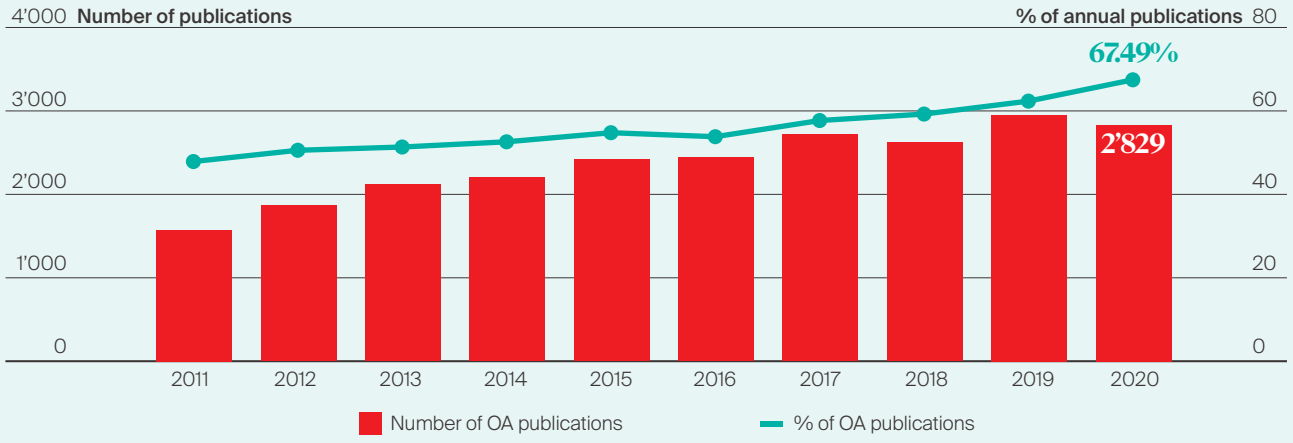


FIGURE 9

THE EVOLUTION OF EPFL THAT HAVE SOME LEVEL OF OPEN ACCESS (SOURCE: INCITES).



EPFL has steadily increased the number and proportion of scientific publications that are considered open access. This is in line with the mandate of SNSF and other public funding bodies to ensure that research financed by public funding is accessible to all.

EPFL actively promotes Open Science initiatives. An internal fund has been created for the period 2019-2021 to encourage open science practice in research, with one call per year. The institution has defined and adopted an Open Access policy in order to support researchers in their dealings with journal editors.

2.3. 2020 Joint professorships

Joint professorships between EPFL and the other ETH research centers

PSI	EMPA	EAWAG	WSL
11	4	4	2

2.4. Success in Europe

The launch of the Horizon Europe, the new framework for EU funding, was delayed in 2021. As a result, none of the ERC calls announced in 2021 resulted in any grants before the end of the year. Nonetheless, EPFL signed 3 new ERC grant contracts (StG, CoG and AdG only) from the concluding H2020 framework. The overall number of grants supported by the EU at EPFL is 162. EPFL remains at the sixth position of academic institutions receiving ERC grants.

Due to Switzerland's status with respect to EU research funding, EPFL is unable to apply for ERC grants, but may still participate in collaborative projects. The larger portion of EU funding received by EPFL within the H2020 framework has been due to these international collaborations. Switzerland's continued exclusion from the EU research funding framework will nonetheless create challenges in achieving the same level of participations in future.

FIGURE 10
NUMBER OF GRANTS RECEIVED PER ACADEMIC INSTITUTION (AS OF 17.01.2022) SINCE THE CREATION OF THE ERCS IN 2007 , DIVIDED INTO STARTING, CONSOLIDATOR AND ADVANCED GRANTS (SOURCE: ERC).

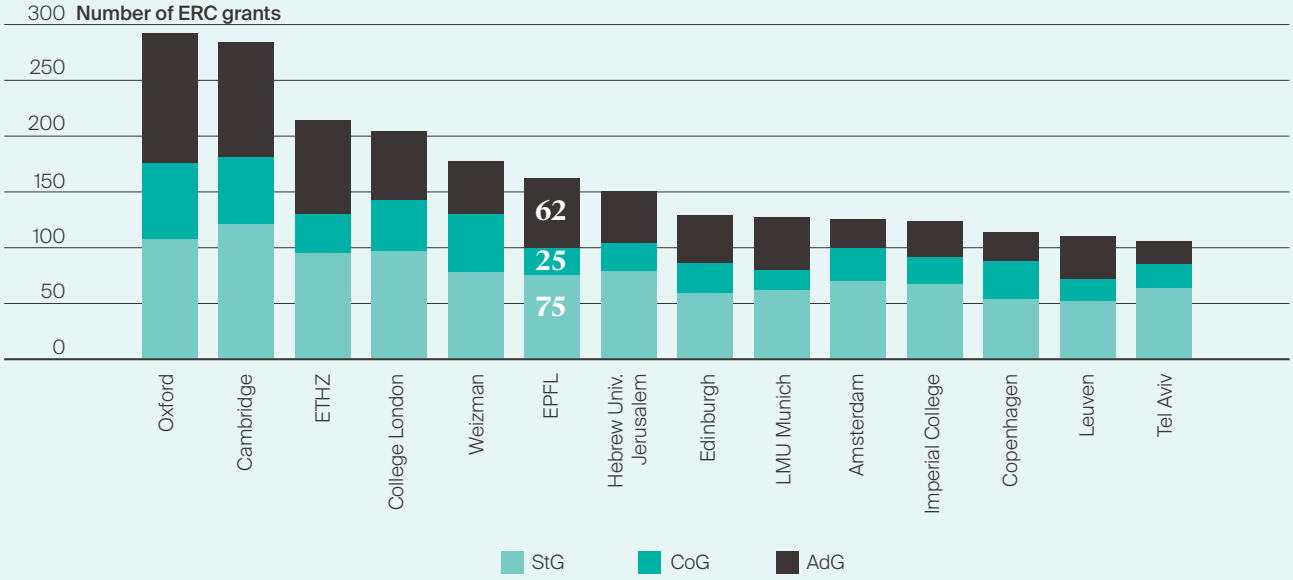


FIGURE 11
NUMBER OF H2020 GRANTS RECEIVED BY EPFL BY TYPE OF COLLABORATION (SOURCE: EU DASHBOARD)

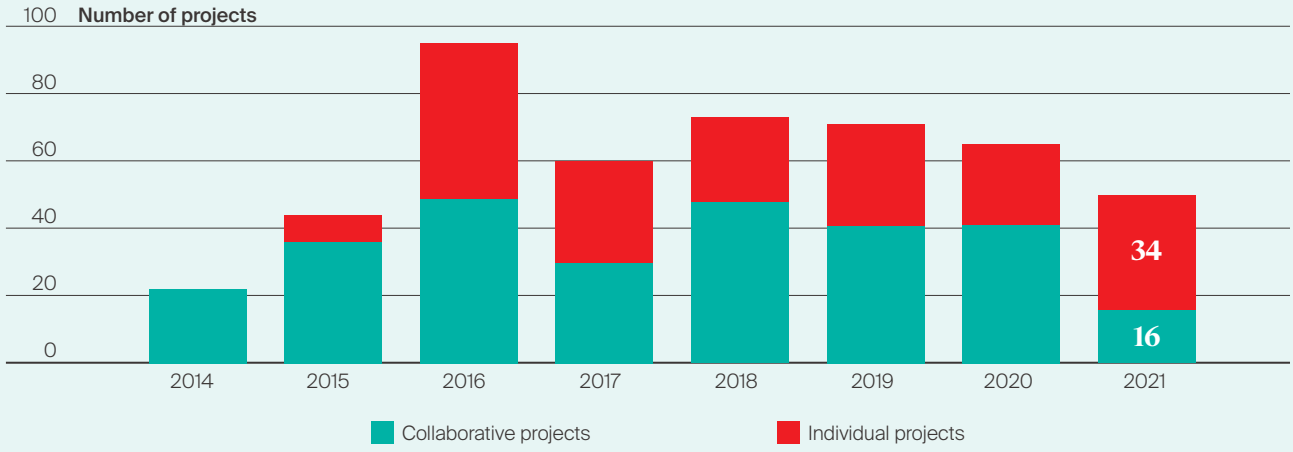
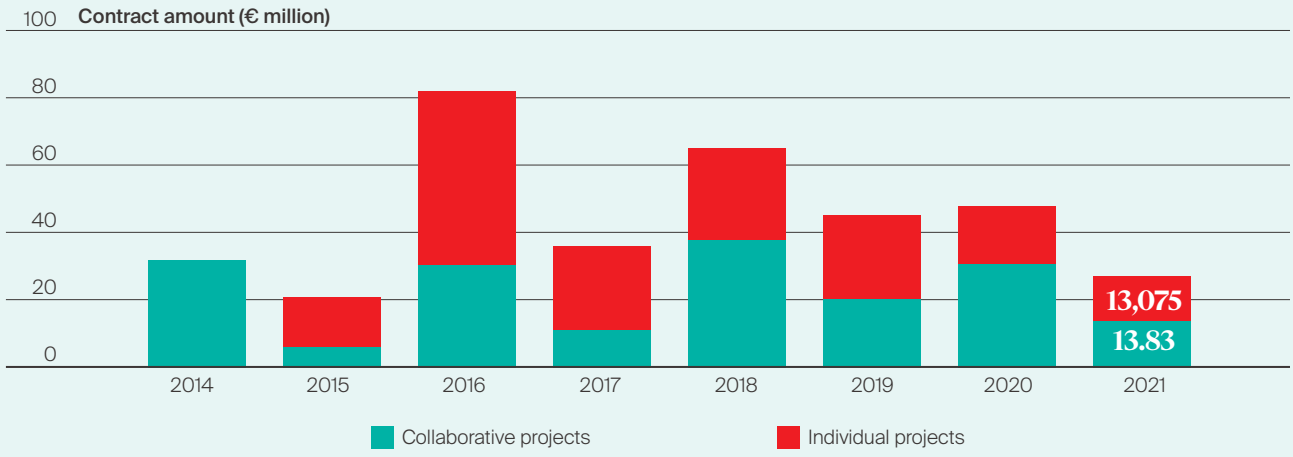


FIGURE 12
AMOUNT IN EUROS OF H2020 GRANTS RECEIVED BY EPFL BY TYPE OF COLLABORATION (SOURCE: EU DASHBOARD)



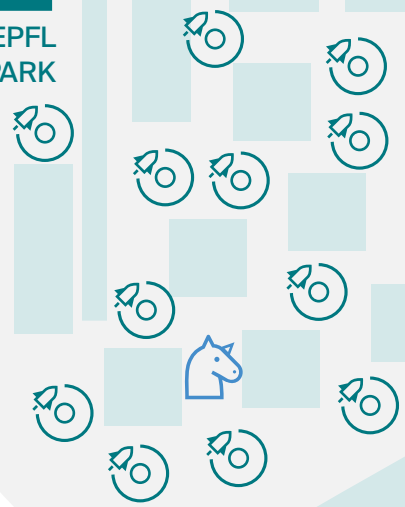
3. INNOVATION IN FIGURES

EPFL's third mission is to foster innovation by being the interface between research and industry for the benefit of society. As a source of disruptive technologies, EPFL relies on a highly agile and versatile ecosystem that provides an excellent opportunity for the researchers, students and its numerous partners - from start-ups to large corporations, from government to NGOs - to be at the forefront of innovation. Pioneering the creation of Switzerland's first innovation park, this unique location allows partners to meet, exchange and share their know-how in an open manner. The illustration aside provides an overview of EPFL's innovation activities using several key performance indicators. Although due to the ongoing COVID-19 pandemic, performance indicators remain strong in all areas.

32
NEW START-UPS CREATED

100%
OCCUPANCY RATE AT EPFL INNOVATION PARK

778.7
MCHF RAISED BY EPFL START-UPS



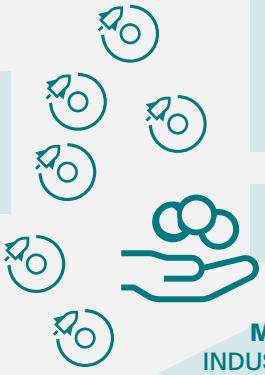
NEXTHINK
HAS REACHED
THE STATUS
OF **UNICORN**

88
PATENTS
FILED

133
INVENTIONS
AND
SOFTWARE

PROJECTS AWARDED
WITH INNOGRANTS
AND IGNITION GRANTS

40
LICENCES
SIGNED



25.3
MCHF RAISED FROM
INDUSTRIAL CONTRACTS
(DIRECT FUNDING)

NEW IPOs FOR
ONWARD MEDICAL,
SOPHIA GENETICS
AND ASTROCAST

13.6
MCHF RAISED FROM
INNOSUISSE PROJECTS

© Jamani Caillet / EPFL
Innovation Park

3.1. EPFL - fertile ground for start-ups

2021 is an exceptional year for EPFL. Nexthink has reached the status of unicorn[1]; the company who helps IT teams deliver a digital work environment, has joined the family of unicorns after Mindmaze, the first Swiss unicorn (2016) to emerge from EPFL. And the IPO record for EPFL: Onward Medical (therapies for spinal cord injuries) was listed in Belgium raising 93 MCHF, Sophia Genetics (genomic and radiomic analyses for hospitals) was listed in the US, raising 212 MCHF and Astrocast (in the niche market of space) was listed in Norway and raised 41 MCHF.

Investments in startups reached 778.8 MCHF[2] (292.7 MCHF in 2020). Besides the funds raised through the 3 IPOS and Nexthink, startups such as Kandou and Mindmaze raised significant funds, 69 MCHF and 116 MCHF, respectively. In addition, companies such as Xsensio, Bloom Biorenewables, Embion Technologies, Urbio, Largo Films, ClearSpace, EarlySight, Annaida Technologies, and RAW Labs raised strong pre-seed and seed rounds setting solid grounds for growth. 33 startups have incorporated in the fields of Engineering, Biotech, ICT, Medtech and Cleantech. In the ranking of Swiss startups[3], 24 startups are in the top 100 and five of them (CREAL, Resistell, Volumina Medical, Bloom Biorenewable and DePoly) in the TOP 20.

EPFL's venture projects and entrepreneurial support activities continue to work on the set of services established to accelerate the transition from the laboratory to the market (Design

1 Startups valued at more than one billion dollars and not listed on the stock market
2 Total for EPFL Startups, including VC, IPO and non-dilutive funds
3 TOP 100 Swiss Startup Award 2020: https://www.top100startups.swiss/

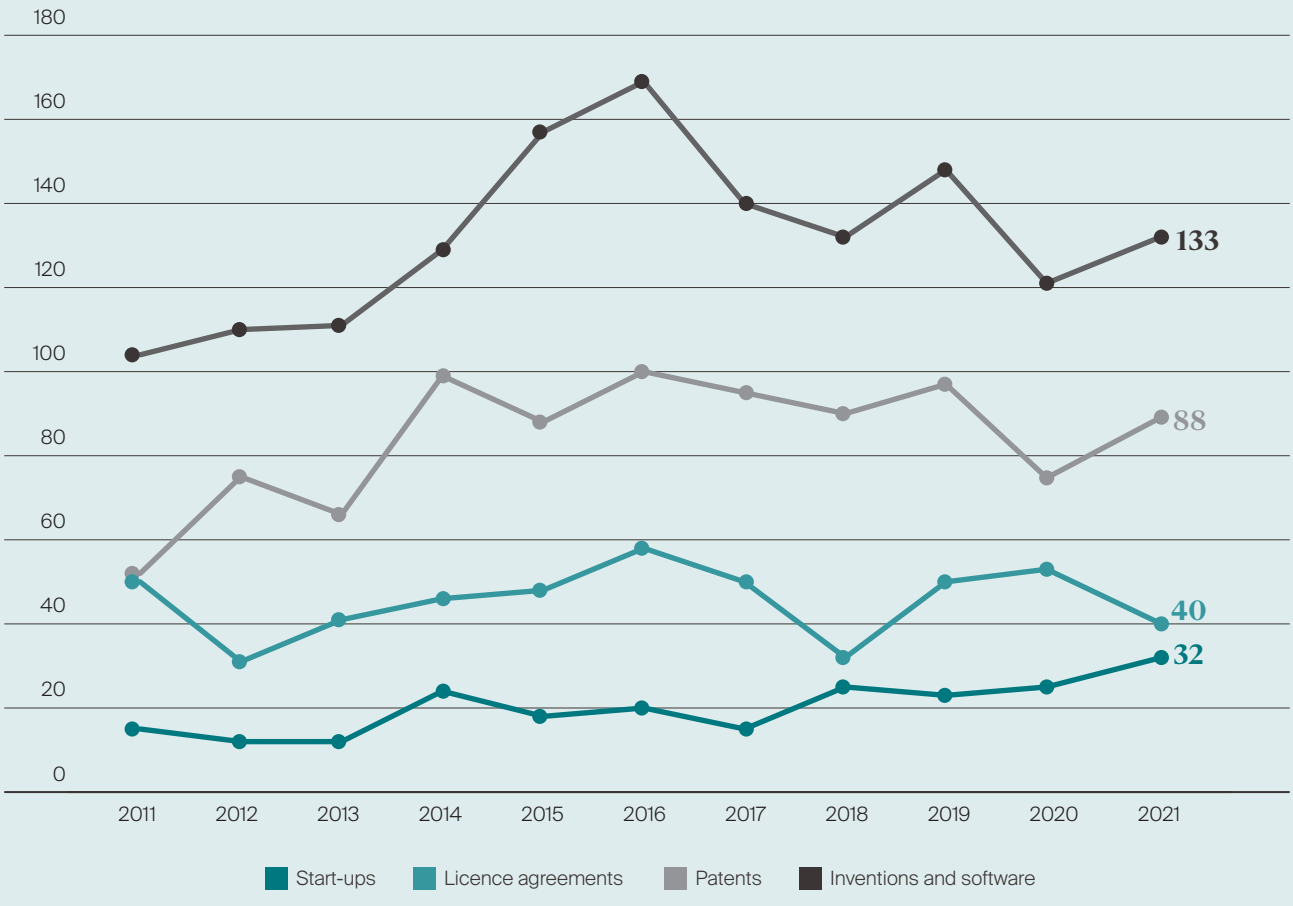
& Prototyping, De-risking, Market Insights and Startup Internships). 13 new projects were supported through Innogrants, 12 through Ignition grants and 11 projects have been accelerated through prototyping and design works. On the student venture side, 2021 saw the launch of Blaze, the EPFL accelerator designed to forward leading student startup projects up to the market, with 14 projects in its first cohorts.

The EPFL Changemakers program - which supports Bachelor and Master Students in turning their ideas into reality, with a societal and sustainable impact - continues its momentum with 2 cohorts of respectively 16 and 18 students. In addition, Changemakers Discovery Camp just started to allow students to meet different actors of the sustainable and social innovation ecosystem and to project themselves in the future projects they wish to carry out whether in an NGO, startup or company.

3.2. A leader in technology transfer

EPFL continues its technology transfer activities under the leadership of its Technology Transfer Office. The main achievements are illustrated by the numbers of inventions and software (133 in 2021), priority patent applications (88 in 2021) and license and technology transfer agreements (40 in 2021).

FIGURE 13
2011-2021 EVOLUTION OVER THE TIME OF THE OUTPUT OF TECHNOLOGY TRANSFER AT EPFL.



3.3. Partnering with industry

In 2021 EPFL has kept the objective of continuing the development of partnership relations with national and international companies. The global economic downturn and the uncertainties due to the COVID-19 pandemic continued to have an impact on industrial relations, with 33 new industrial relations and 94 research agreements[4], but there are good indications of a rebound both from total industrial fundings and from Innosuisse collaborations.

94 **research agreements and 33 new industrial relations**

Although the number of industrial contracts signed this year is similar to 2020, the amount of direct funding from industry is 25.3 MCHF, with a significant increase of 23% compared to the previous year (20.6 MCHF in 2020). the institution sees this amount is higher than the average of the last 10 years (22.53 MCHF on average).

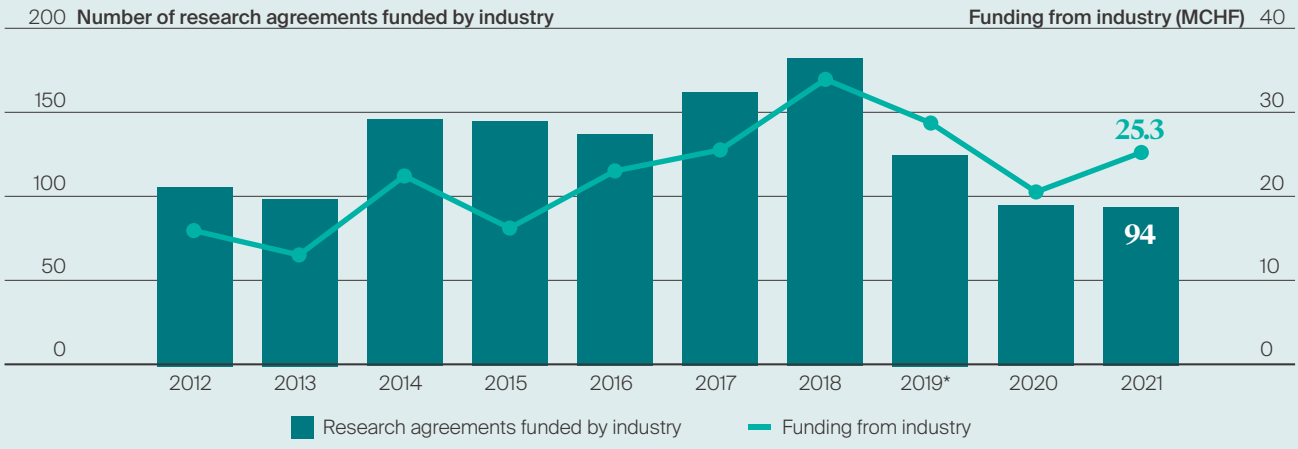
On the Innosuisse side, EPFL managed to secure 29 (22 in 2020) projects with industry financed by the Innovation Agency. The total Innosuisse funding to EPFL for Innovation projects was 13.6 MCHF, of which 12.2 MCHF with industrial partners. These indicators are much higher than the previous two years, with an increase in the funding amount of more than 30%.

EPFL has conducted the «SME Customer Journey to Innovation» study to better understand the challenges SMEs face innovation as standalone process. This will allow EPFL's support to be adjusted to the expressed needs and pain points of companies. In order to nurture exchanges with SMEs, the 4th edition of FORWARD, the innovation forum for SMEs, is being prepared with a pre-conference organized at Microcity in Neuchâtel in collaboration with CSEM.

Once again, this year, EPFL Innovation Park reached a 100% occupancy rate, confirming the value of being immersed

4 After 2018, according to the CEPF, the definition of research agreements is to count only the contracts with an industrial partner with amount not less than 50kCHF.

FIGURE 14
2012-2021 EVOLUTION OF THE NUMBER OF RESEARCH AGREEMENTS AND DIRECT FUNDING FROM THE INDUSTRY.



*After 2018, according to the CEPF, the definition of research agreements is to count only the contracts with an industrial partner with amount not less than 50kCHF.

in a rich and diverse ecosystem. EPFL's approach to strategic partnerships has therefore led the VPI to launch the new K-NOVA program that provides students and researchers with easy access to potential industrial partners for their projects, whether they are research, start-up or career opportunities. At the same time, industrial partners who join this program can test the value of the EPFL ecosystem for one year to nurture and develop their innovation projects. A first company, Chargeurs, has already joined the program in May. Other companies signed up to start the program in early 2022.

3.4. Promoting innovation

In 2021, Tech4Impact hosted the annual Showcase 2030 - bringing together +500 online participants to showcase disruptive, innovative, and entrepreneurial EPFL solutions. The Initiative also ran the Tech4Impact Summer School and the Discovery Camp, involving over 100 EPFL and international Bachelor, Master, and Ph.D. students exploring the development of sustainable entrepreneurial solutions.

Since 2019, Tech4Dev, in partnership with the Swiss Development Cooperation (SDC), aims to play a pioneering role in accelerating and scaling innovative and beneficiary-centered technological solutions to impact the Global South region. First, challenges are sourced together with an NGO council of 26 active members and afterward matched with EPFL researchers and Labs. In 2021, Tech4Dev kept its commitment to impact-driven projects supporting four new collaborative research projects with 1.2 MCHF, 40% directly in the global South.

Space technologies hold enormous untapped potential and generate valuable knowledge about our planet's ecosystem, climate and society, enabling solutions to some of the major challenges of our time. Space Innovation activities help to strengthen ties with Swiss industrial partners and to establish long-term relationships with them. This is why they are part of the VPI. From improving existing products to supporting start-ups, Space Innovation is a reliable partner in the innovation cycle of space products in Switzerland. In 2021, Space Innovation welcomed 5 new industrial members (Syderal Swiss, CompPair, Kistler, the Swiss Armed Forces, Coactum). The 3rd edition of the IGLUNA flagship project – space habitat with remote operations - brought together 9 countries, 12 teams and 240 students. They developed bottom-up ideas into technologies for the future of space exploration and highlighted potential commercial applications on Earth and in space.

4. SCIENCE FOR SOCIETY

4.1. National and international tasks

4.1.1. Blue Brain Project (BBP)

In 2021, the EPFL Blue Brain Project transitioned from its focus on regional brain tissue models to its push to a whole mouse brain model by 2024. Accordingly, scientific refinements were made to complete the regional models and paving the way for their public dissemination. Similarly, a first faithful model of the neuro-glia-vasculature unit has been published. In parallel, a critically important innovation for the new whole brain focus, namely the ability to automatically construct detailed knowledge graphs automatically from literature mining, has been successfully field-tested in the fight against COVID-19. To support other scientific users in adopting BBP's capability to run in silico experiments using supercomputers, a newly developed massive open online course (MOOC) has been released and BBP tools have been deployed into the EBRAINS research infrastructure as part of the EC Human Brain Project, which has been accepted as candidate on Europe's ESFRI roadmap.

4.1.2. Swiss Plasma Center

The Swiss Plasma Center is a national laboratory with international facilities, fully embedded in the EPFL academic environment, focused on the development of plasma science and fusion energy. The Swiss plasma Center operates in the context of the EUROfusion Consortium, which coordinates fusion research in the EU on behalf of Euratom, and pursues the EU Roadmap to fusion energy. Focus is on the international ITER and DEMO projects, which will demonstrate the feasibility of fusion energy for peaceful purposes, and that fusion reactors can provide economically competitive carbon-free electricity to the grid, respectively. Given the long-term character of fusion developments, the Swiss Plasma Center is heavily invested in the education and training of young scientists and engineers.

Despite the second consecutive year of the COVID-19 pandemic, all core activities of the Swiss Plasma Center have continued successfully, with a combination of home working and on-site technical and experimental activities. These activities contributed to enlarging our physics understanding of plasmas of interest for magnetic fusion, both in the core of confinement devices and at their edge, where hot plasmas interface with material surfaces, and to advance the exploration of plasma related technologies.

On the TCV tokamak, intense experimental campaigns were operated both for the domestic program and for EUROfusion. Almost 2000 successful plasma discharges were run, a major achievement since three planned interruptions dedicated partly to changing the in-vessel structures took place, as needed by the European effort to identify the best divertor configurations to control the plasma-wall interactions, and partly to installing

a second, 1MW, neutral beam injector to increase the reactor relevance of TCV plasmas.

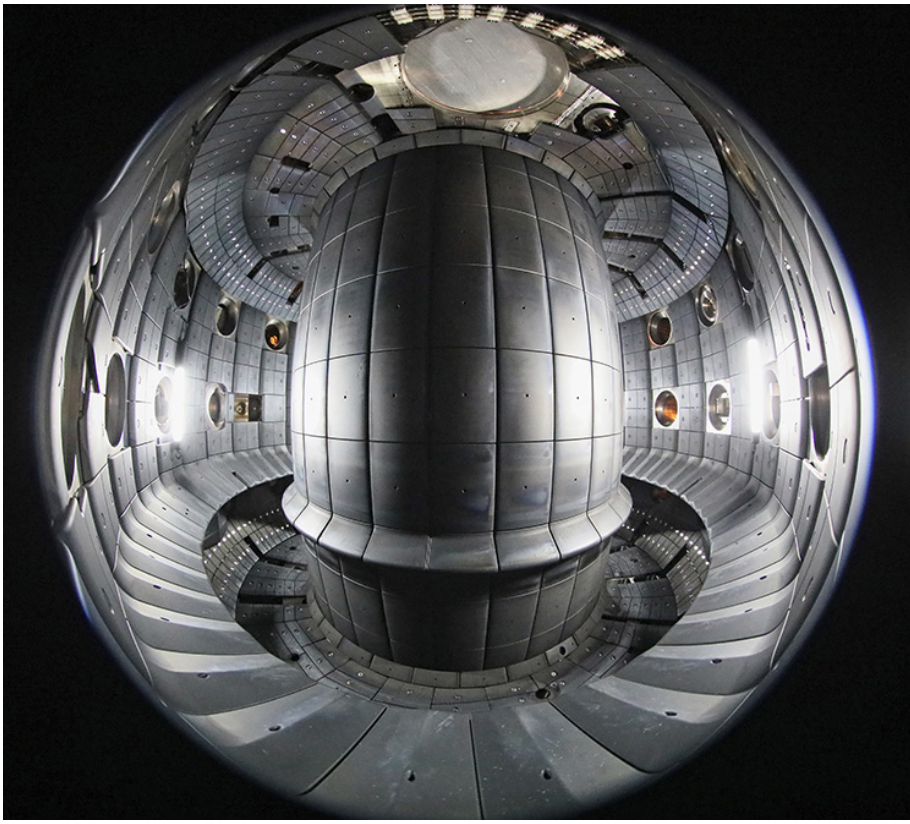
In addition to the in-vessel baffles and neutral beams, the TCV upgrade program was completed successfully with the installation of an additional 1MW microwave source for high density plasma heating, and a set of new or improved diagnostic systems, including a new imaging Motional Stark Effect diagnostic that will provide the first direct current-profile measurement on TCV.

To reduce the operational risk of ITER, disruptions and runaway electrons were investigated, while negative-triangularity and doublet plasma shapes were explored in view of optimizing the plasma performance of DEMO. Negative triangularity plasmas in particular brought TCV to record confinement performance in regimes with no violent edge instabilities. Novel methods to control the plasma and its radiation in localized regions at the plasma edge were also demonstrated.

In 2021, the Swiss Plasma Center was attributed an Advanced Computing Hub of EUROfusion, to provide scientific and technical support to European fusion simulation effort. This hub, led by the Swiss Plasma Center, brings together a multidisciplinary group of scientists from EPFL's Institute of Mathematics, the high-performance scientific computing platform (SCITAS), the Laboratory for Experimental Museology, and the Swiss Data Science Center.

In 2021, the applied superconductivity group, located at the Paul Scherrer Institute in Villigen, broadened the testing activities on superconducting cables and joints to post-ITER tokamak projects, namely the Chinese CFETR, the US privately funded SPARC tokamak based on high-temperature superconductors, and the EUROfusion DEMO.

In parallel with fusion R&D, significant progress was achieved in the laboratory for biological applications of plasmas. First measurements of reactive species in dielectric barrier plasmas were obtained using pico-second laser-induced fluorescence. Single-cell micro-fluidic treatment of bacteria using plasma-activated water have been imaged for the first time using phase contrast and fluorescence time-lapse microscopy. These advances pave the road to unveil the fundamental interaction mechanisms between plasmas and biological organisms.



Swiss Plasma Center Tokamak thermonuclear fusion reactor.
© EPFL / A. Herzog

4.1.3. Swiss Centre for Applied Ecotoxicology

In 2021, the Ecotox Centre at EPFL has investigated the influence of suspended matter quality in Lake Geneva on chironomids using the interdisciplinary experimental platform LéXPLORE. Moreover, the Centre has evaluated the biological water and sediment quality in the Chamberonne, a river near Lausanne that will be restored to a more natural state. In addition, the Ecotox Centre has continued its work on the DNA barcoding of oligochaete communities for the assessment of biological sediment quality as well as its work on the bioavailability and toxicity of tire wear particles. It has also published a guidance document for the cantonal agencies on the sampling and quality assessment of sediments.

In soil ecotoxicology, the Centre has reviewed the available methods for determining soil guidance values and is working on recommendations for Switzerland how to determine these values. Soil guidance values for pesticides are needed to monitor the reduction in pesticide risk that is required through the National Action Plan for Risk Reduction and Sustainable Use of Plant Protection Products.

In 2021, external funding totaling ca. 1,32 MCHF was acquired for projects. 0.498 MCHF of this funding (43%) supported work at EPFL. 31% of the Ecotox Centre publications were authored by staff based at EPFL in 2021.

4.1.4. Center for Digital Trust (C4DT)

The Center for Digital Trust (C4DT, c4dt.epfl.ch) is an academic-industry alliance of international relevance that facilitates innovation in digital trust services and products. It brings together industry partners, EPFL laboratories, civil society, and policy actors to collaborate, share insight, and to gain early access to trust-building technologies, building on state-of-the-art research at EPFL and beyond.

C4DT focuses on three domains:

- First, facilitating technology transfer and ensuring competitiveness of Switzerland on those issues, by giving access to EPFL research capacity and talents.
- Second, raising awareness of decision-makers and developing a community of interest around the topic.
- And third, developing advocacy/policy activities, both at Swiss and international levels, allowing EPFL to become an international reference center on the subject.

This is achieved by a close collaboration with the authorities (both at cantonal and federal levels) on the 4 strategic government activities (Digital Action Plan, Cybersecurity strategy, Cyberdefence strategy and Swiss Security Network), representing EPFL and coordinating participation to international initiatives and fostering collaboration with other academic institutions.

In 2021 the Center continued its growth by hiring 1 more collaborator, thus increasing its headcount to 12. By signing a partnership with Ruag AG and

by integrating three other promising companies (DuoKey, Futurae, NYM) as part of its start-up program, the number of partners has grown to 21.

Furthermore, C4DT kickstarted 25 bilateral projects since its inception (8 new in 2021), ran workshops, multiple panel discussions and conferences (such as on digital identity, digital immunity passport, 5G security, AI and pharma, zero trust cloud, crypto-assets and asset tokenization) as well as ensured training sessions for the partners. C4DT also participated in the development of new functionalities of the SwissCovid app.

Finally, C4DT ensured the coordination between EPFL and ETHZ of the Swiss Support Center for Cybersecurity (SSCC) activities, with 2 workshops (Dependencies in Modern IT Systems, Ransomware Attacks) having been organized in 2021.

C4DT Center for Digital Trust

4.1.5. Medical training

EPFL contributes to medical education by providing a path to a Master in medicine for a subset of students with strong quantitative and engineering skills. In 2017, it established the new formula of its pathway program towards medical studies ("Passerelles"), initially launched in 2012. Two Passerelles are offered, one toward the Faculty of Biology and Medicine of the University of Lausanne (UNIL), and one toward the Faculty of Medicine of the University of Geneva (UNIGE).

The UNIL Passerelle allows a limited number of EPFL life sciences Bachelor students to enter medical studies at Master level (fourth year), provided that they pass an entrance examination and attend one year of bridging courses, both organized by UNIL. To prepare for this entrance examination, EPFL has organized in its third-year life sciences Bachelor program a series of specially-designed courses. A fourth series of EPFL bachelor graduates completed this EPFL track in 2020-2021. A total of 8 students attempted the exam and 4 of them were admitted into the program. Up to 10 places have been already reserved for EPFL students for next year.

The UNIGE Passerelle offers dual training in engineering and medicine to a small number of EPFL graduates. It is essentially intended for students with an EPFL Master degree. Candidates are pre-screened by EPFL and then selected on file by the Faculty of Medicine of UNIGE. In 2020, 4 students were selected for this program out of 9 applicants.

4.1.6. International relations

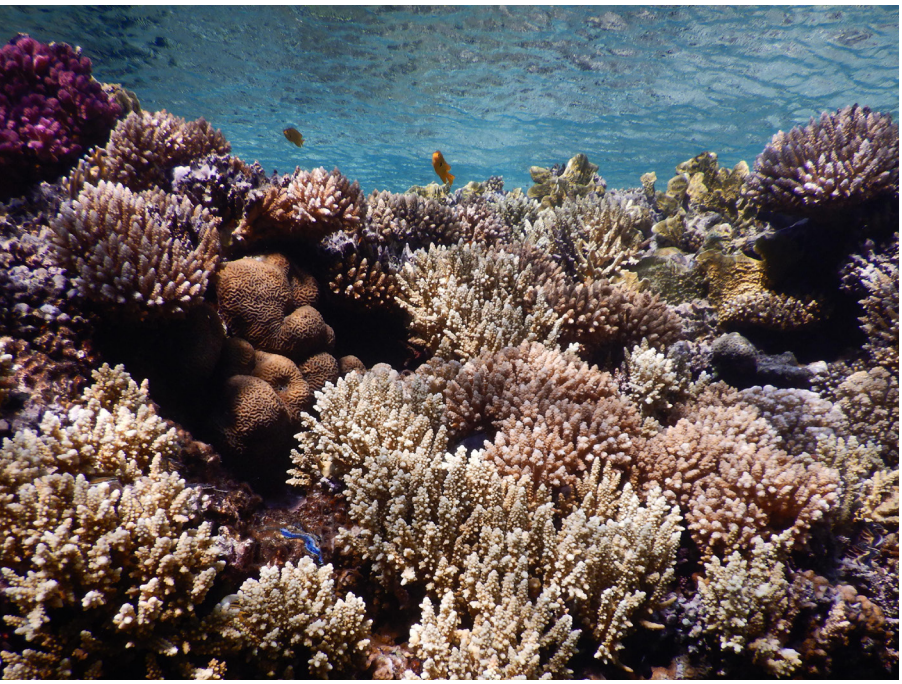
EPFL Middle East Campus

EPFL Middle East maintained its activities in 2021. The UAE Minister of Higher Education visited EPFL in September 2021 to trigger a new collaboration model for the years to come.

Excellence in Africa

The new Center «Excellence in Africa (EXAF)», jointly implemented with the Université Mohammed VI Polytechnique (UM6P) in Morocco, will fund six research projects (max. budget per project = 0.72 MCHF) between EPFL and African professors. Three projects have started, and three other contracts should be signed shortly. The 2nd pillar of the EXAF program called "100 PhDs" launched its first call early this year. Around 10 PhDs, co-supervised by an EPFL professor will be funded (max. budget per project = 0.08 MCHF). Moreover, six academic institutions across Africa were selected to develop centers of competence in digital education (budget per center = 0.26 MCHF). The World Bank, acknowledging the importance of digital education for the African continent, agreed to fund the development of another six centers. Finally, the African Cities Lab (ACL) initiative aims to create a digital education platform and its content on urban planning and urban development in Africa. More than 10 massive online open courses (MOOCs) will be developed.

Transnational Red Sea Center © Maoz Fine



Red Sea

The Transnational Red Sea Center working on the unique Red Sea corals with strong support from the Swiss foreign ministry, started a first expedition from Aqaba in July. Due to an incident the expedition had to be postponed to next year. It was replaced by a 10 days scouting mission along the Sudanese coast, together with local scientists from the Red Sea University in Port Sudan.

Croatia

The program with Croatia supports young professors to start a career as tenure-track assistant professor in Croatian academic institutions. It is funded by the Swiss Development Agency. While the research work is making progress as planned, the pandemic limited physical exchanges among the EPFL professors involved in the mentoring and the tenure-track professors in Croatia. The Croatian government is using this program as a blueprint to develop new models of supporting young talent in starting an academic career.

The Square Kilometre Array, or SKA.
© 2020 EPFL

Square Kilometre Array (SKA)

Since 2016 the EPFL has been coordinating the Swiss research community interested in SKA, the next-generation radio telescope infrastructure. A new level of collaboration has been reached by signing an agreement with SERI to coordinate and prepare the Swiss community, interested in SKA. Earlier this year SKA became an international organization (SKAO) like CERN. The decision to build the telescope was taken by the SKAO Board at the end of June. Switzerland, having an observer status in SKAO, is represented in 2021 by EPFL. SERI prepared a new bill to the Swiss parliament to become a full member of SKAO for the next ten years which was approved in December.

Sofia Institute on Computing Sciences

Together with ETHZ, EPFL is helping to set-up an institute on computing sciences as an independent part of Sofia University. An agreement between EPFL, ETHZ, Sofia University and the Bulgarian government was signed in 2021. The creation of this new institute was approved by the Bulgarian government and the Bulgarian parliament ratified an 85 M€ budget for the next ten years.

European collaboration

Switzerland's decision to end negotiations on an institutional framework agreement with the EU blocked the association to Horizon Europe. Discussions with different key stakeholders in Switzerland and the EU are ongoing to limit the negative impact on EPFL.

Scholar at Risk (SAR)

EPFL has hosted its first scholar at risk, coming from Kurdistan, with financial support from the SNSF (0.12 MCHF). The hire of 3 additional scholars at risk from Afghanistan is in progress, based on SNSF funding.

4.2. Fundraising

Over the course of 2021, philanthropic support to EPFL sat at over 35 MCHF through 21 gifts resulting from 30 pledges.

Out of the 21 gifts, 11 were for the Philanthropy Strategic Initiatives (as defined by the Presidency), 2 for Chairs (both in SV), and 8 for Special Opportunities.

Of the total raised, 41% was for the 2 Chairs , 12% for the Strategic Initiatives, and 47% for Special opportunities.

Strategic initiatives deep dive:

- 4 gifts were for SSP - 3 of which were made by first time donors (Alumni).
- The 4th gift was a repeat donation with an Alumni link.
- 3 gifts were for LEARN - 2 of which were repeat gifts. The 3rd was from a new donor.
- 1 gift was for Pavilions from a repeat donor.

The newly added Strategic Initiative, E4S, saw 3 gifts from existing donors.

Special opportunities deep dive:

- When looking at Special Opportunities funding, 64% of this funding is linked to one of the Chair donation and over 26% was made by a donor who first gave in 2017 and who has now made a total of 3 gifts to EPFL.
- Overall, EPFL is seeing positive results from the improved stewardship of the school's donors. This is encouraging and a strong signal that a professionalized and robust Philanthropy Services team can bring real impact to the school.
- Over the course of 2021, the Philanthropy team was made up of a total of 5.4 FTE (excluding Dev. Dir.). The current forecast for 2022 is 5.3 FTE (excluding Dev. Dir.).

The current revenue projection for 2022 sits at 28 MCHF (this include over 23 MCHF of projected income for new Chairs and Special opportunities).

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4.3. Collaboration within the ETH Domain

4.3.1. SFA Swiss Data Science Center

The SDSC has developed into a leading Data Science and AI player in Switzerland, with a quantifiable impact on academia and industry. Today, the SDSC offers strong expertise and services across the complete data life cycle, from data collection to the acceleration of its use. As of December 2021, the SDSC employs 60 scientists and software engineers, collaborates on 53 first-class academic research projects, and has signed 17 strategic partnerships with 12 organizations in Swiss industry. The SDSC actively teaches university curricula at Bachelors, Masters, and Doctoral levels and offers Executive Education to professionals.

SDSC brings two key assets to the Swiss research and innovation landscape:

- A qualified and experienced team who can work with researchers and industry partners on projects, providing the specialist expertise needed to conduct cutting edge data science and AI: The SDSC uses an innovative partnership model to work with research groups and innovation units, which not only provides the skills, but helps build data science capacities in the labs and/or business units that partner with the SDSC.
- An Open Research Data (ORD) platform, called Renku, to foster reproducible, reusable and collaborative Data Science and AI: Using Renku, data science projects can be discussed, repeated, and verified, and split up into components which can be individually shared, reused, and recombined.

To ensure that the above assets bring value where needed, the SDSC has adopted an operational model centered around the notion of core services. More specifically, during the 2017–2024 period, SDSC received 75 MCHF in ETH Board funding with an additional third-party competitive funding of 17 MCHF, for a total budget of 92 MCHF. Such financing is split between three core services, respectively encompassing Data Science and AI (for academia – AI for Science, and industry – AI for Innovation), software platforms and ORD services (ORD Platform for AI), and education and training services.

4.3.2. SFA Advanced Manufacturing

EPFL is involved in multiple projects in the 2021-2024 phase of the SFA-AM in close collaboration with the other institutions of the ETH Domain.

- In the AMYS project (Advancing Manufacturability of Hybrid Organic-inorganic Semiconductors for Large Area Optoelectronics), researchers from the PV Lab at EPFL are working with researchers from EMPA and ETHZ to develop new types of solar cells, photodetectors, and light emitting diodes using novel perovskite materials.
- In the ClosedLoop-LM (Ultrafast Laser Closed-loop Manufacturing using mid-IR Spectroscopy) project, researchers from Galatea lab at EPFL are working with researchers from ETHZ, EMPA, and PSI to advance ultrafast laser processing for novel manufacturing.
- In the DiPrintProtect (Digitally Printed Temporary Protective Films for Application in the Watch Industry) project, researchers from the Laboratory for processing of advanced composites at EPFL are working with researchers from EMPA and ETHZ to develop novel digital techniques for forming protecting coatings on watches.
- In the MANUFHAPTICS (Manufacturing of Actuators Integrated in Active Exoskeletons) project, researchers from the soft transducers lab at EPFL are working with researchers from ETHZ and EMPA to develop novel functional materials and scalable additive manufacturing processes for soft actuators that are directly integrated in an elastomer exoskeleton.
- In the Microfluidics (Functional Integration for Rapid Realization of Microreactors and Bio-assays) project, researchers from the Laboratory for advanced fabrication technologies at EPFL are working with researchers from ETHZ, PSI, and EMPA to develop manufacturing techniques for new smart microfluidic systems.
- In the Multi-Mat (Multi-material laser powder-bed fusion) project, researchers from the laboratory of thermomechanical metallurgy at EPFL are working with researchers from ETHZ, EMPA, and PSI to advance the capabilities of powder-bed fusion based fabrication of metal components.
- In the SCALAR (Highly Scaled Gravure Printing) project, researchers from the Laboratory for advanced fabrication technologies and the laboratory for solar energy conversion at EPFL are working with researchers from ETHZ and EMPA to apply highly-scale high-speed gravure printing to novel functional electronic and optical systems.
- In the SMARTAM (Fast Optimization of Additively Manufactured Metallic Parts with a Combination of Adaptive Feedforward Control and Numerical Simulation) project, researchers from the laboratory of thermomechanical metallurgy are working with researchers from EMPA, PSI, and ETHZ to develop techniques to exploit machine learning and simulation to rapidly optimize laser powder bed fusion-based fabrication of metallic parts.

As such, EPFL has a major role in all 8 of the projects launched in this cycle of the SFA-AM. During 2021, significant advancement has been made in the establishment of a manufacturing platform under the auspices of the Micro Manufacturing Science and Engineering Center – M2C. The center is under the

scientific directorship of Prof. Vivek Subramanian, and under the operational directorship of Mr. Bruno Studach. The M2C facilities are located in the Neuchatel campus of EPFL and include equipment for advanced microfabrication and characterization. Several tools have already been established, including state of the art additive microfabrication tools for multi-material printing, and associated tools for characterization, inspection, and metrology. These have already been deployed and are used by researchers across EPFL, CSEM, and indeed, are even used by researchers from local companies. Some of the tools have also been deployed in a new set of project-based learning classes for EPFL students.

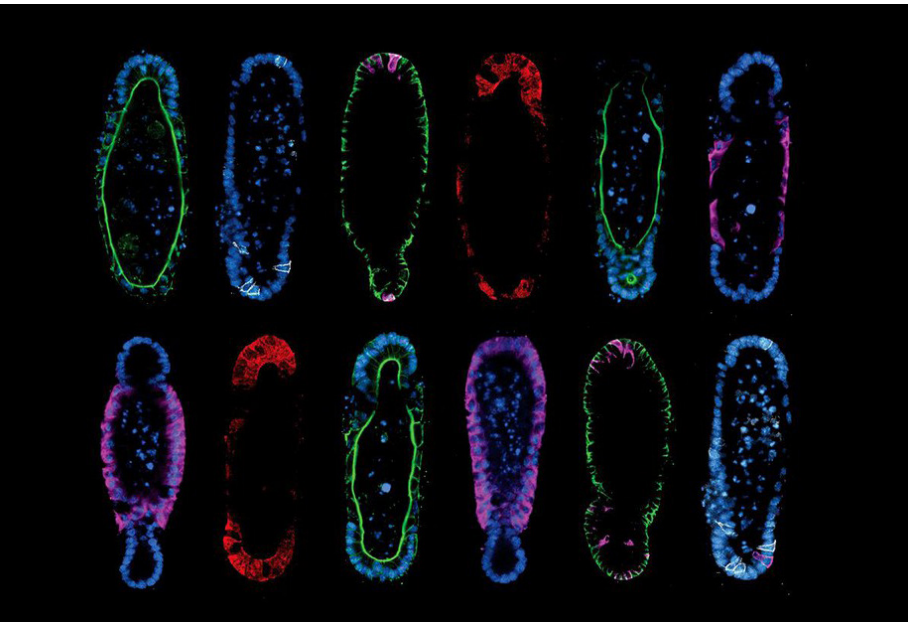
A major new advanced manufacturing platform is in the process of being established using funds previously allocated from the sale of the Jaquet-Droz 7 (JD7) building on the Neuchâtel campus. In collaboration with CSEM, several tools have been identified for purchase to establish this platform. A state-of-the-art metal powder bed fusion 3D printer has already been delivered and set up, and an advanced laser system for laser processing has been delivered as well. Several other tools have also been specified, ordered, and/or opened for bidding, and the platform is well on its way to being fully established for use by researchers across the ETH domain and in Switzerland at large. This platform will allow researchers to have access to state-of-the-art capabilities in 1) high-precision additive manufacturing with metals, 2) advanced multi-material manufacturing and 3) free-form manufacturing with femtosecond lasers. It is expected that all tooling will be in place by the end of 2022, and as the platform expands, it will serve as a focal point for advanced micromanufacturing science and engineering research in Switzerland.

Strategic Focus Area
Advanced Manufacturing

4.3.3. SFA Personalized Health and Related Technologies

Personalized Health and Related Technologies (PHRT) is one of four strategic focus areas of the ETH Domain and aims to contribute to the global effort of improving the quality of healthcare through earlier and better diagnosis as well as providing a choice of individual therapeutic strategies for the patient based on their unique biological make-up. PHRT collaborates tightly with other global programs and the complementary national initiative Swiss Personalized Health Network (SPHN), frequently bringing together a broad network of relevant stakeholders and promoting the nationwide use and exchange of health data for research purposes. Through PHRT, institutions of the ETH Domain play a leading role in the development of novel technologies relevant for personalized health, the development and operation of large and highly specialized research infrastructures, the development of medical technology devices, as well as technology platforms.

EPFL plays a key role in bio-medical research and has several PHRT-supported projects that ensure internal and external cross-domain collaborations. The multi-institutional nature of these projects, bringing together university hospitals and technology institutes, is essential for ensuring translational research. During the successful first phase of PHRT (2017-2020), the program not only supported several research and education (doctoral and postdoctoral)



Tissue geometry controls intestinal organoid patterning
© Mike Nikolaev, EPFL

projects with participation of EPFL groups but also funded multi-omics platforms to digitalize data of clinical cohorts. EPFL was the recipient of the PHRT funds (to prof. J. Fellay) for supporting the development of the Health2030 Genome center, which serves as a technological hub and as a leading house for putting genomic medicine within reach of the whole Swiss population. The Genome Center aims at delivering high-scale and high-quality clinical grade sequencing services (both data generation and data analysis) to the research and clinical community. The Center benefits from a very tight and fruitful collaboration with the PHRT-supported ETHZ-based Clinical Proteotype Analysis Center, and together these two platforms aim at establishing a Swiss omics pipeline that will contribute to propel the country at the forefront of precision medicine. The Genome Center is the Clinical Genomic Analysis Center for the recently launched Swiss Multi-omics Center (http://smoc.ethz.ch) providing one entry point for three integrated centers.

Thanks to the continued support of PHRT to EPFL, the Health 2030 Genome Center obtained (Dec 2020) its accreditation by the SAS (Swiss Accreditation Service). The Genome Center is thus officially accredited to perform whole genome, exome and RNA sequencing in any disease context, a feat that no Swiss institution and very few around the world have achieved. This accreditation will boost the development of the Health 2030 Genome Center by opening its gates to clinical genomics, an essential pillar of precision medicine. In 2021, the Genome Center has been an essential pillar of the national SARS-CoV-2 Surveillance program, having whole genome sequenced some 30'000 positive specimens across Switzerland. This effort received support from the FOPH and places Switzerland among the countries with the best coverage rates in Europe.

Having just entered the second phase of national funding (2021-2024,), EPFL thus finds itself at the heart of personalized health initiatives in Switzerland by helping to define national strategies, supporting the Health 2030 Genome Center, participating in several translational research projects, and contributing two other pillars of precision medicine by hosting the Swiss Data Science Center (SFA-SDCS) and the SCITAS high-performance computing cluster.

Strategic Focus Area
Personalized Health and Related Technologies

4.3.4. SFA Energy

In 2020, EPFL confirmed to be one EPFL is one of the most successful and attractive energy research hubs in Switzerland and worldwide. Out of the 370 EPFL laboratories, about one fourth are active in the field of energy. Their activities cover a large spectrum of research expertise ranging from theory and simulation of materials, plasma physics, photovoltaics, or nanochemistry, to high-tech systems engineering as showcased for instance by EPFL's Power-to-X cluster currently developing in Sion, its smart grid platform on the Lausanne campus, the Smart Living Lab in Fribourg (established jointly with the Haute école d'ingénierie et d'architecture de Fribourg and the University of Fribourg), and its worldwide acknowledged facilities for hydraulic machines testing and hydraulic constructions.

In 2021, EPFL has been ranked 5th in the world and 1st in Europe in the field of "Energy Science & Engineering" by the authoritative Shanghai Ranking. 6 out of EPFL's 16 "highly cited researchers 2021" work in the field of energy, e.g.: Profs. Christophe Ballif, Anders Hagfeldt, Michael Graetzel, Xile Hu, Mohammad Kaja Nazeeruddin, and Shaik M. Zakeeruddin. The list recognizes world-class researchers selected for their exceptional research performance, demonstrated by the production of multiple highly cited papers that rank in the top 1% by citations for field and year in the Web of Science.

In the field of research in energy, EPFL is standing up as a major actor of the Swiss Energy Transition. In addition to the demonstration projects in Valais, EPFL is developing outstanding projects in the field of Carbon Capture, Utilization and Storage (CCUS), that will become essential to reach the goals of the Paris agreement. Other specific subjects include: the flexibilization and optimal design/operation of future hydraulic power plants, the development of intelligent systems for the management of the power grids integrating energy storage technologies, the development of energy efficient transportation systems (e.g. hyperloop), as well as socio-economic studies. Overall, more than 290 projects (of which more than 90 EU projects) in fundamental or high-end applied energy research were active at EPFL in 2021.

Regarding the education in energy, 2021 saw the graduation of the first set of students from the EPFL specialized Master in energy science and technology, launched in 2019.

Regarding innovation and tech transfer, EPFL energy laboratories have paved the way for the creation of about 40 startups in recent years, and 9 additional startups are currently in creation.

4.3.5. Swiss Polar Institute

In 2020, the SPI maintained a high level of activities, gain a new institutional member and launch new international collaborations. For example, the SPI became a partner in the EUPolarNet 2 consortium in October and signed a Statement of Commitment with the Australian Antarctic Division (AAD) in November.

Within Switzerland, the SPI also gained a national status, since the State Secretariat for Education, Research and Innovation confirmed its selection as a “research institution of national importance”. It also reinforced and renewed some important partnerships with, for example, the BNP Paribas Swiss Foundation for a period of three years.

Regarding the funding activities, particular focus was put on the launch of the PolARTS pilot programme, co-created and co-funded with Pro Helvetia, the Swiss Arts Council. The preparation of the future SPI Flagship Initiatives to be launched in January 2021, a central pillar of the SPI strategy up to 2025 and beyond, also proved to be a major activity.

Working at the edge of the Antarctic plateau. © Preben Van Overmeiren, Ghent University.

4.3.6. List of competence centers

National Centres of Competence in Research	EPFL	ETHZ	PSI	EMPA	EAWAG	WSL
Antiresist						
Suchat (Catalysis)						
Dependable Ubiquitous Automation						
Microbiomes						
Bio-Inspired Materials						
Digital Fabrication						
MARVEL						
MSE - Molecular Systems Engineering						
MUST - Molecular Ultrafast Science and Technology						
On the Move: The Migration-Mobility Nexux						
PlanetS						
QSIT: Quantum Science and Technology						
The Role of RNA Biology in Disease Mechanisms						
Robotics: Intelligent Robots for Improving the Quality of Life						
SwissMAP - The Mathematics of Physics						
Chemical Biology						
Synapsy - The synaptic bases of mental diseases						
TransCure						
Swiss Competence Centers for Energy Research	**EPFL**	**ETHZ**	**PSI**	**EMPA**	**EAWAG**	**WSL**
EIP: Efficiency of industrial processes						
FURIES: Future Swiss Electrical Infrastructure						
HaE: Heat Electricity Storage						
SoE: Supply of electricity						
CREST: Energy, Society and Transition						
Efficient Technologies and Systems for Mobility						
BIOSWEET: Biomass for Swiss Energy Future						
Strategic Focus Area	**EPFL**	**ETHZ**	**PSI**	**EMPA**	**EAWAG**	**WSL**
Swiss Data Science Center						
Advanced Manufacturing						
Personalized Health and Related Technologies						
Energy Research						
National initiatives	**EPFL**	**ETHZ**	**PSI**	**EMPA**	**EAWAG**	**WSL**
Swiss Plasma Center (SPC)						
Swiss Polar Institute (SPI)						
Swiss Personalized Health Network (SPHN)						
Competence Centre for Materials Science and Technology						

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