

Annual report 2019



ETH IN FIGURES

STUDENTS

headcount (rounded figure)

22,200

students

of which

4,170

doctoral students

from **126**
countries

32.9%
women

of which **630**
MAS/MBA students
(incl. teaching diploma)

STAFF HEADCOUNT

full-time equivalents,
annual average figure (rounded)

500
professors

2,890
technical and
administrative staff

6,280
scientific staff

170
apprentices

+3.3%
increase
in staff
vs. 2018

33.7%
women

INCREASE IN PEOPLE AND FACILITIES

values in %

+65
students

+36
staff

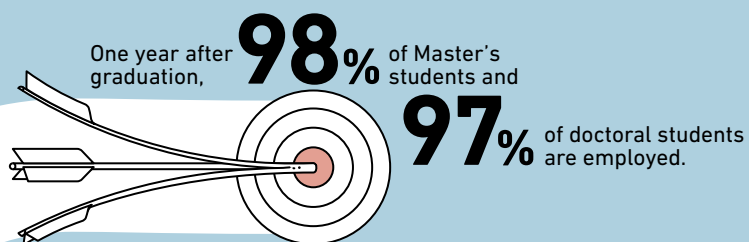
2007 2019

laboratories,
testing areas

+21
+19

teaching/
social areas,
offices,
infrastructure

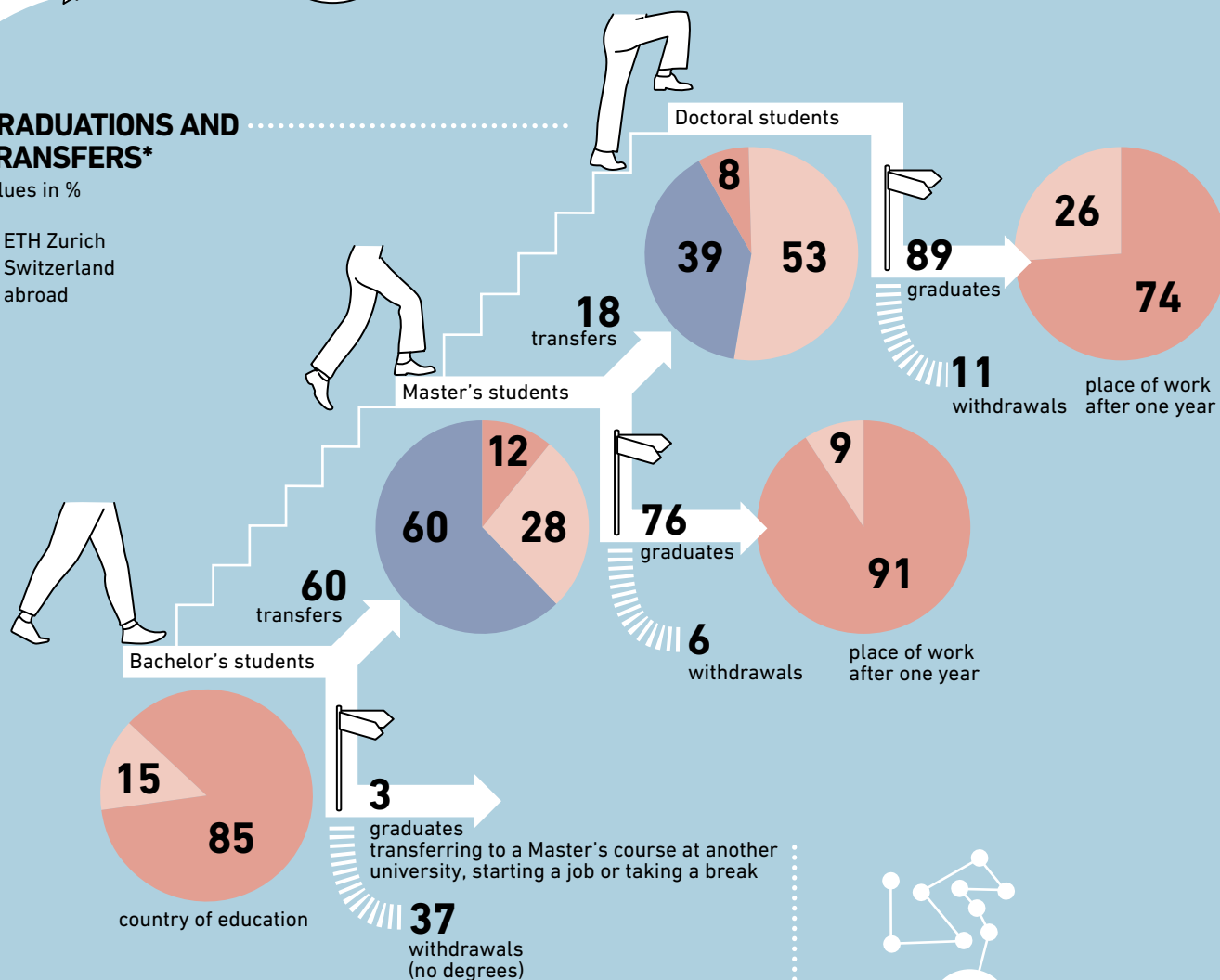
2007 2019



GRADUATIONS AND TRANSFERS*

values in %

■ ETH Zurich
■ Switzerland
■ abroad



* excl. continuing education students

NEW STUDENTS

Bachelor's degree programmes with the most entrants

398

BSc in Computer Science

446

BSc in Mechanical Engineering

293

BSc in Health Sciences and Technology

277

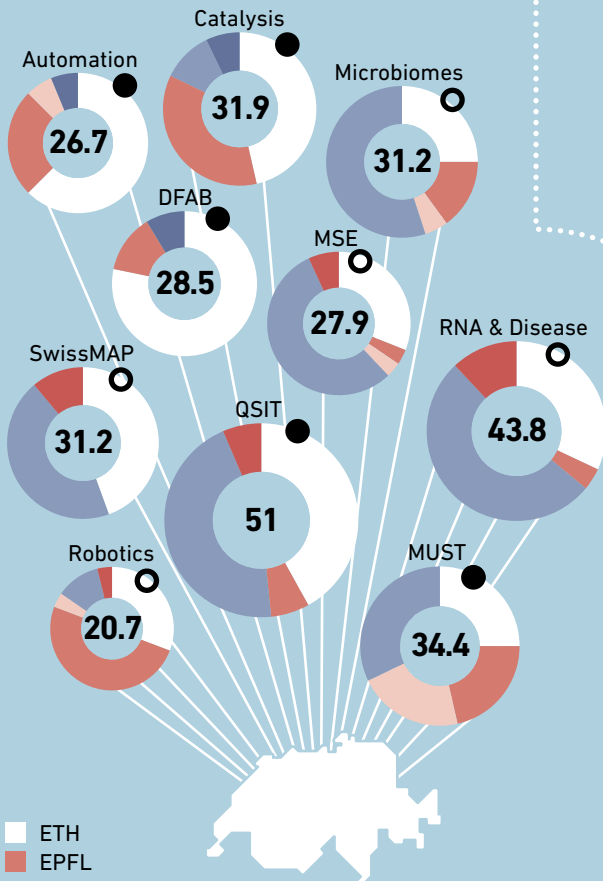
BSc in Electrical Engineering and Information Technology

258

BSc in Architecture

NATIONAL CENTRES OF COMPETENCE IN RESEARCH (NCCRs) WITH ETH AS LEAD OR CO-LEAD

funding volume in CHF million and allocation of leading researchers



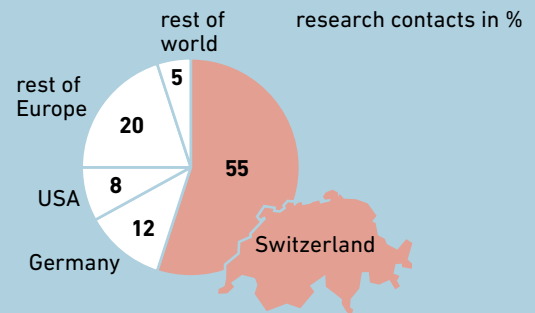
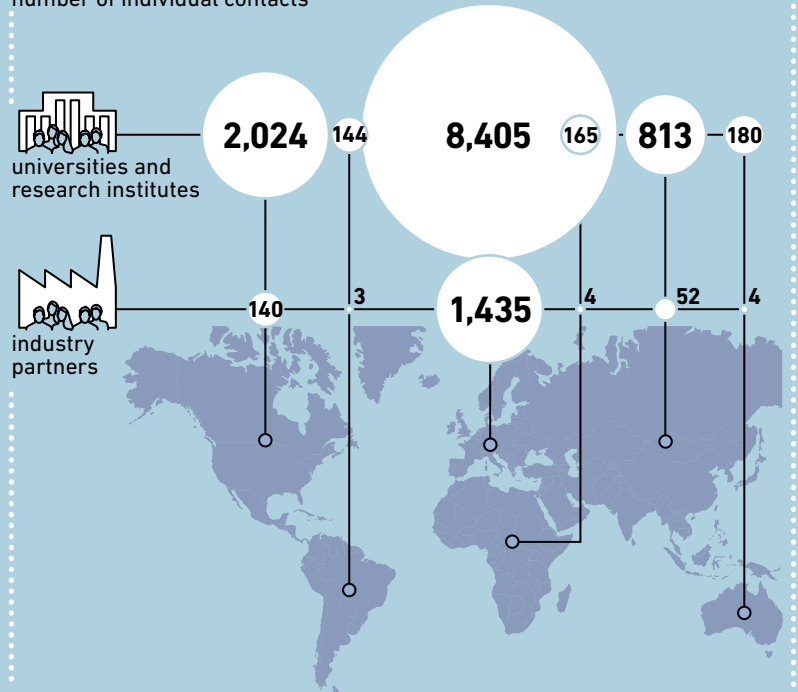
■ ETH
 ■ EPFL
 ■ Empa, Eawag, PSI, WSL
 ■ universities
 ■ universities of applied science
 ■ other research institutes

● ETH lead
 ○ ETH co-lead

More information on individual NCCRs:
www.ethz.ch/nccr

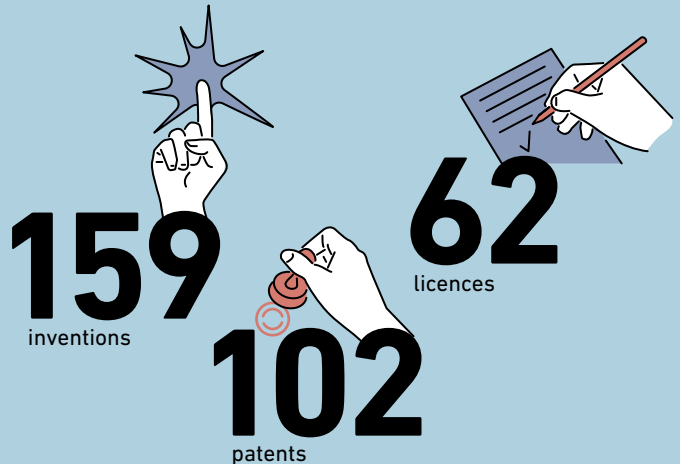
NATIONAL AND INTERNATIONAL RESEARCH CONTACTS

number of individual contacts



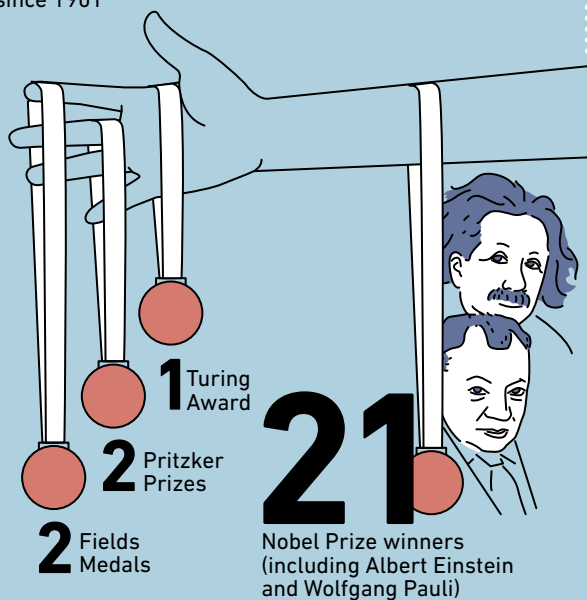
Source: Annual Academic Achievements (AAA) and International Knowledge Base (IKB)

PATENTS, LICENCES, INVENTIONS

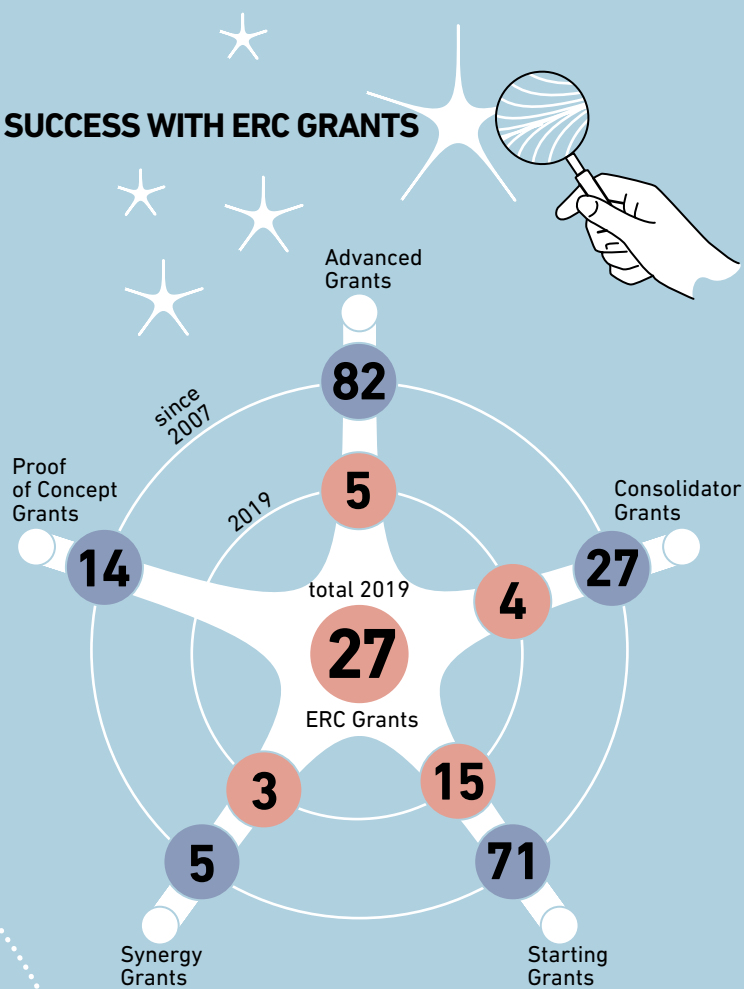


PRIZES

since 1901



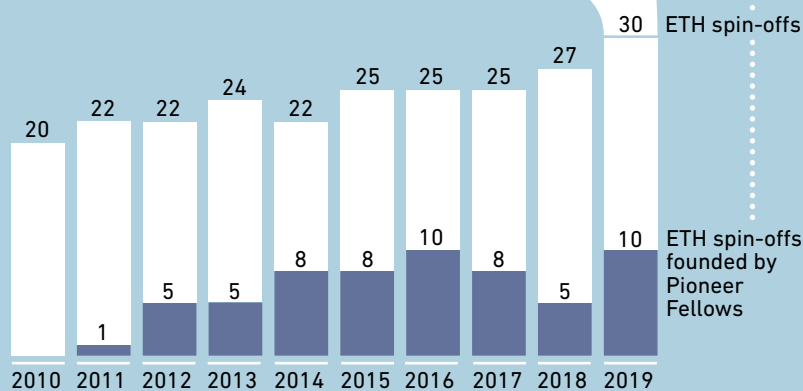
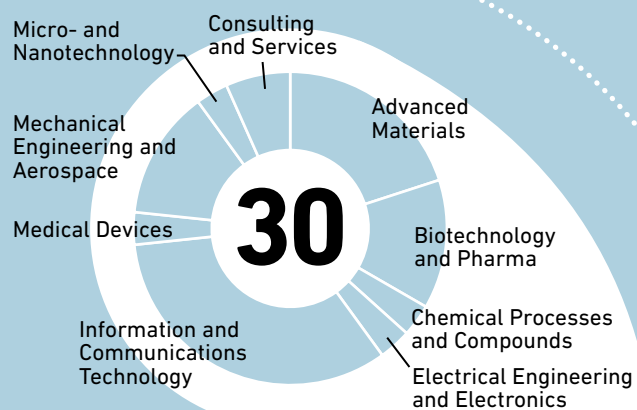
SUCCESS WITH ERC GRANTS



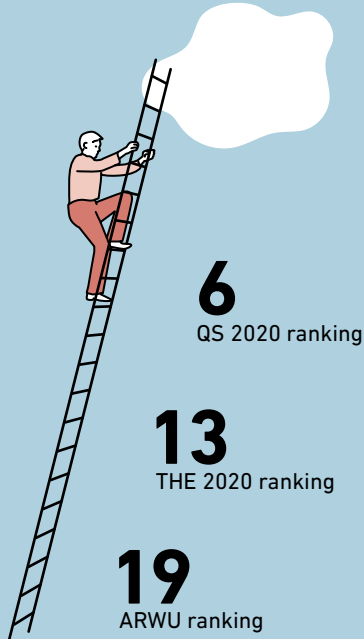
total received



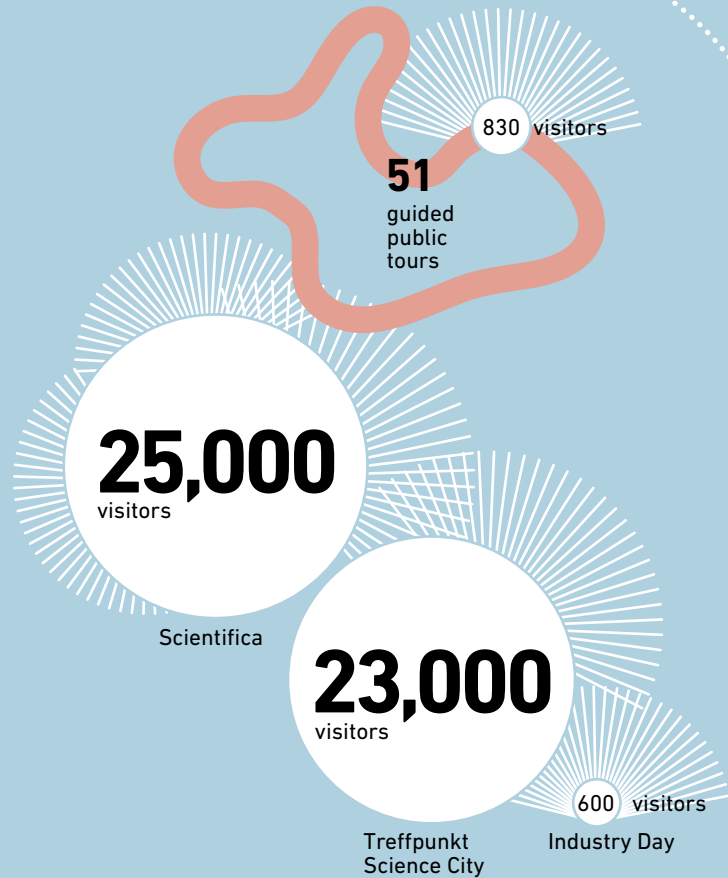
SPIN-OFFS



PLACES IN INTERNATIONAL UNIVERSITY RANKINGS

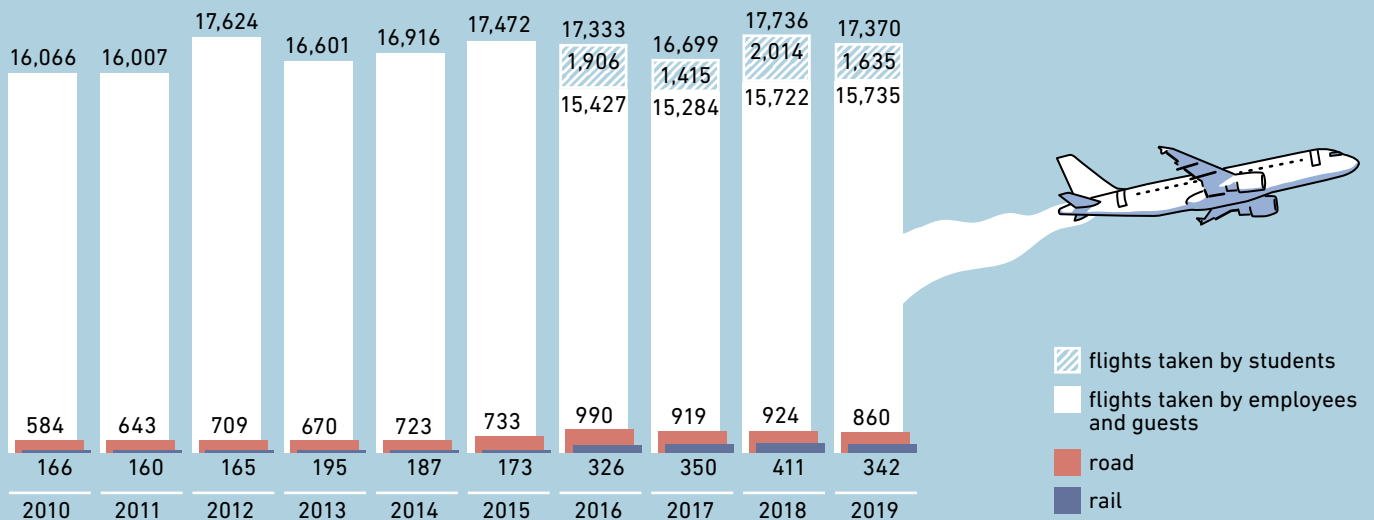


OUTREACH AND PUBLIC ENGAGEMENT



BUSINESS TRIPS

greenhouse gas emissions from ETH Zurich business trips – annual comparison in tonnes of CO₂ equivalents

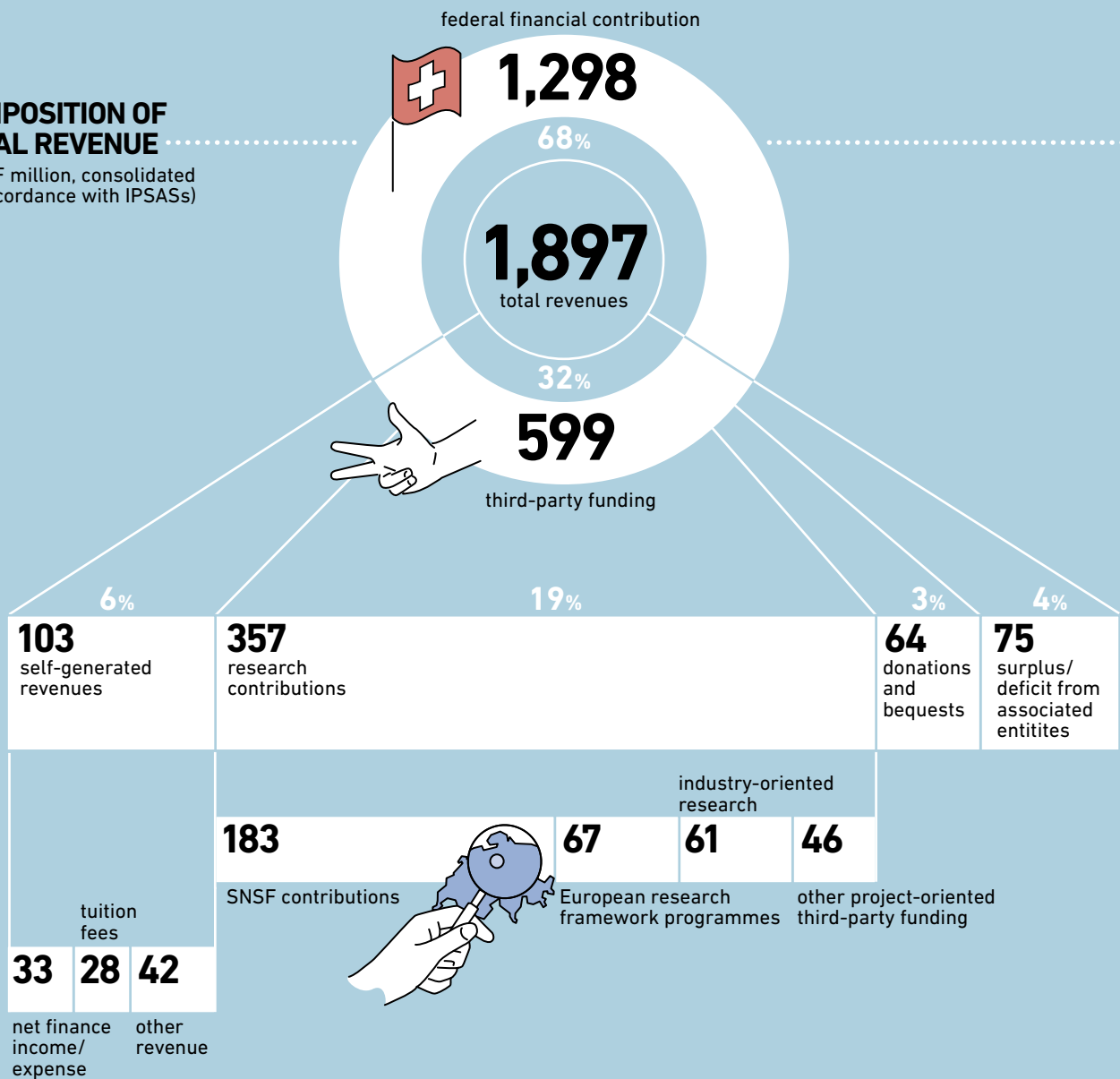


2010–2015: greenhouse gas emissions from ETH Zurich business travel, summary, www.ethz.ch/dienstreisen-2016 (in German only)

2016–2019 (new methodology, incl. students): greenhouse gas emissions from ETH Zurich business travel in 2019, www.ethz.ch/dienstreisen-2019 (in German only) and www.ethz.ch/assessment-emissions

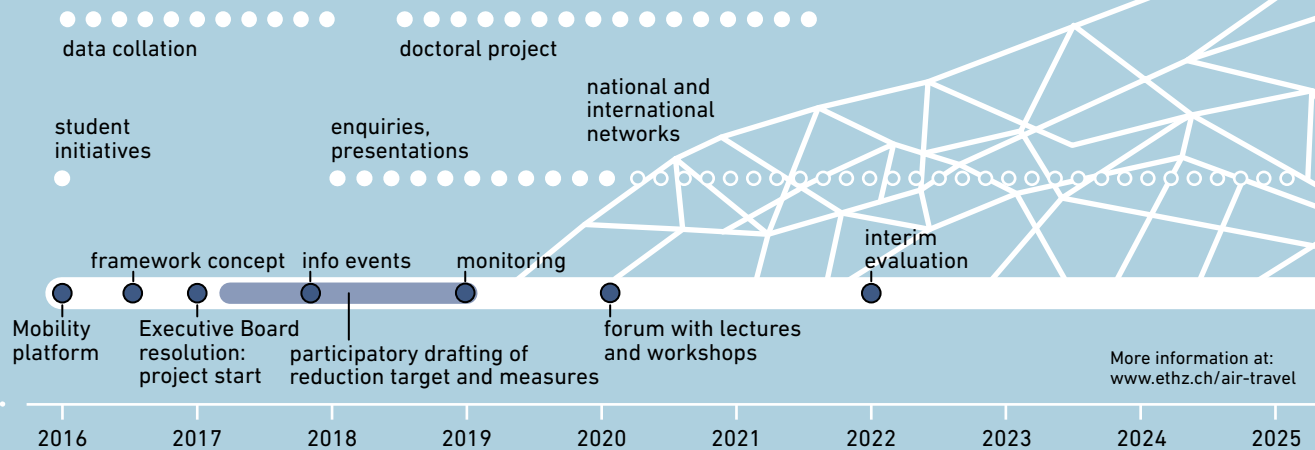
COMPOSITION OF TOTAL REVENUE

in CHF million, consolidated
(in accordance with IPSASs)



ETH AIR TRAVEL PROJECT "STAY GROUNDED, KEEP CONNECTED"

Limiting air travel is an effective means of reducing
CO₂ emissions at ETH.





We live in a very complex world. Climate change, population growth, geopolitical tensions, migration and the disruption of society and business by digital technologies: all these challenges directly affect Switzerland and lay bare the profound interdependencies of today's highly networked world.

Universities play a pivotal role in mastering these challenges and exploiting the opportunities presented by change. They generate new knowledge and shape the next generation of technical experts, managers, scientists and entrepreneurs, while their research lays the foundation for future innovations. In this sense ETH Zurich has once again fulfilled its educational and scientific mandate in 2019. This is evidenced by the award of around 5,000 degrees and continuing education qualifications, new study programmes such as the Master's course in cyber security, 30 spin-off companies and numerous research results that have won national and international acclaim.

Over the past year, ETH scientists created the first fully computer-generated genome of a bacterium. They have developed a prosthetic leg with sensory features and showcased technology capable of producing renewable fuel from sunlight, CO₂ and water. In recognition of their outstanding scientific work, many colleagues have won a series of prizes, including the Swiss Science Prize Marcel Benoist, the National Latsis Prize, along with no fewer than 27 ERC Grants.

Given Switzerland's high expectations and the increasingly competitive environment, we must continuously develop and improve our university. In launching the rETHink project, we have initiated a process designed to strengthen our institutional independence and preserve it over the long run.

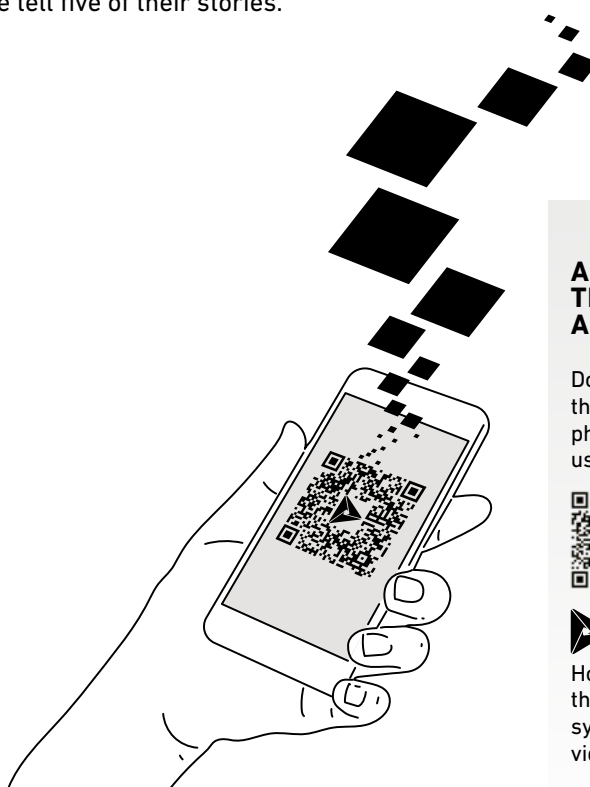
We are aware that we are only able to sustain such a high-level performance thanks to the favourable conditions provided by our owners, the Swiss government. These include autonomy, transparency and a solid financial base. All that remains is for me to thank you, in your role as politician, member of industry or taxpayer, for the trust you continue to place in ETH Zurich.

I hope you enjoy reading this year's annual report.

Joël Mesot, President of ETH Zurich

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AUGMENTED REALITY TECHNOLOGY IN THE ANNUAL REPORT:

Download the app – developed by the ETH start-up CLIPTHIS – to your phone at www.clip-this.com and use it to scan the QR code below.



Hold your phone's camera over the images carrying the CLIPTHIS symbol to watch the accompanying videos.

HIGHLIGHTS

Find out more about these and other highlights in our ETH News at www.ethz.ch/news-archive



CARBON-NEUTRAL FUEL FROM SUNLIGHT AND AIR

The parabolic reflector mounted on the roof of ETH Zurich's Machine Laboratory building is a world first: the solar plant produces liquid fuel exclusively from sunlight and air. The solar mini-refinery extracts CO₂ and water directly from ambient air to create a synthetic gas which is liquefied into methanol in the reactor. Fuel produced in this way is carbon-neutral, because only as much CO₂ is released on combustion as was extracted from the air during production.



NEW MASTER'S DEGREE IN CYBER SECURITY

In an increasingly networked society, cyber threats represent a growing risk. Countering these threats requires specific expertise and highly trained specialists. EPFL and ETH Zurich have responded to this by launching a new joint Master's degree in cyber security in Autumn Semester 2019. This is Switzerland's first university-level degree programme in cyber security.



COMPUTER-GENERATED GENOME

ETH Professor Beat Christen and his team have developed a method that greatly simplifies the production of large DNA molecules. ETH researchers have created in the laboratory the world's first genome of a bacterium – *Caulobacter ethensis-2.0* – to be designed entirely by computer. The method has the potential to revolutionise biotechnology: synthetic microorganisms could be created that could be utilised for the production of pharmaceutically active molecules or vitamins.

THE FIRST ETH UNICORN GALLOPS AHEAD

After completing a new round of capital investment last May, the ETH spin-off GetYourGuide co-founded by Johannes Reck and Tao Tao in 2009 has reached an estimated value of over 1 billion Swiss francs. The travel guide platform is the university's first spin-off to gain the celebrated status of a "unicorn", the term used by investors to describe start-ups which are so promising that their market value exceeds 1 billion dollars even before they go public with an IPO.





HEIDI WINS SECOND PLACE

Last June a team from ARIS (*Akademische Raumfahrt Initiative Schweiz*) took part in the Spaceport America Cup in New Mexico, USA. *HEIDI*, the rocket the students built in their free time, was a soaring success. Under the competition rules, the rockets must climb as close as possible to 10,000 feet (3,048 metres) and parachute back to the ground. *HEIDI* reached 9,298 feet to finish 2nd in a field of almost 40 other teams.



DIGITALLY DESIGNED HOUSE

Opened in 2019, the DFAB House is the world's first habitable house to be designed, planned and built using predominantly digital processes, with the help of 3D printers and robots. Scientists from eight ETH Zurich professorships have teamed up with business partners to bring several innovative digital building technologies from the laboratory into practice. The technologies can make construction more sustainable and efficient.



OUTSTANDING MATERIALS RESEARCH

Nicola Spaldin received the Swiss Science Prize Marcel Benoist for her research into multiferroics, a new class of materials that respond to both magnetic and electric fields – making her just the second woman to be awarded in the prize's nearly 100-year history. The ETH Professor of Materials Theory investigated why multiferroics are so rare and how they can be produced. Her pioneering work has paved the way for the future development of electronic devices with entirely new architectures and greater energy efficiency. Potential applications include ultra-fast computers, tiny data storage units and precision measuring devices.





HOW TALENT THRIVES

How is digitalisation changing higher education and the nurturing of talent? These were the key themes discussed by more than 400 university leaders and education decision-makers at the *Times Higher Education* World Academic Summit hosted by ETH Zurich. Given the rapid pace of technological change, the summit underscored the importance of critical thinking, ethical codes and cost consciousness. In addition to factual knowledge and technical skills, higher education must impart problem-solving skills and lifelong learning capabilities.



PROSTHESIS THAT CAN FEEL

A European consortium headed by ETH Professor Stanisa Raspopovic has developed a neurofeedback system that enables people with an above-knee amputation to feel their prosthetic foot and knee as if it were part of their own body. The system includes tiny electrodes implanted in the thigh to transmit information from sensors to the nervous system. This allows the wearer to perceive contact with the ground and movements of the prosthesis as natural sensory feedback, which increases their confidence in the artificial leg and makes walking less strenuous.

BETWEEN FACT AND FICTION

Some 25,000 visitors came along to Scientifica 2019 to be inspired by the latest research showcased at exhibition stands, short talks, science cafés and shows. Investigating the relationship of "Science Fiction – Science Facts", the University of Zurich and ETH Zurich offered a look into the future and demonstrated that what might seem like fiction today could well become fact before too long.





SIGNALS FROM MARS

Four months after the InSight probe landed on Mars, its seismometer – which ETH helped to develop – has already been sending back very promising signals. Seismologists at the ETH Marsquake Service have classed one of the signals received back in April as a possible marsquake. The scientists believe the measurements show that a marsquake's intensity is closer to the type of seismic activity recorded on the moon than to earthquakes. For the first time, these findings give an insight into the formation of Mars's inner crust.



ETH AT OLMA

ETH Zurich traveled to St. Gallen for OLMA, Switzerland's biggest food and agriculture show, where the university took part with an exhibition stand for the second time. ETH introduced visitors to the world of microorganisms and highlighted their importance for agriculture and society as a whole. Plenty of scientists were on hand to show how science and technology support human health and can improve food safety. Federal Councillor Alain Berset also visited the ETH stand to find out about the invisible but vitally important world of soil bacteria.

REALISTIC ENERGY RESEARCH

ReMaP is an energy research platform jointly established by ETH Zurich, the Paul Scherrer Institute and Empa. It was launched at the end of 2018 and presented to Swiss industry and future partners and users in June 2019. ReMaP is now being expanded step-by-step under the auspices of the Energy Science Centre at ETH. The platform's simulations and experiments provide users with a realistic environment where they can investigate the complex relationships that will one day characterise the energy system at neighbourhood level.



ETH Zurich educates its students to become highly qualified and eminently employable specialists and prepares them for positions of responsibility as critically engaged members of society. Degree programmes that meet high professional and conceptual standards and encourage independence make the university an attractive place to study. The teaching is continually evaluated and refined, so as to offer the best possible all-round education.

TEACHING





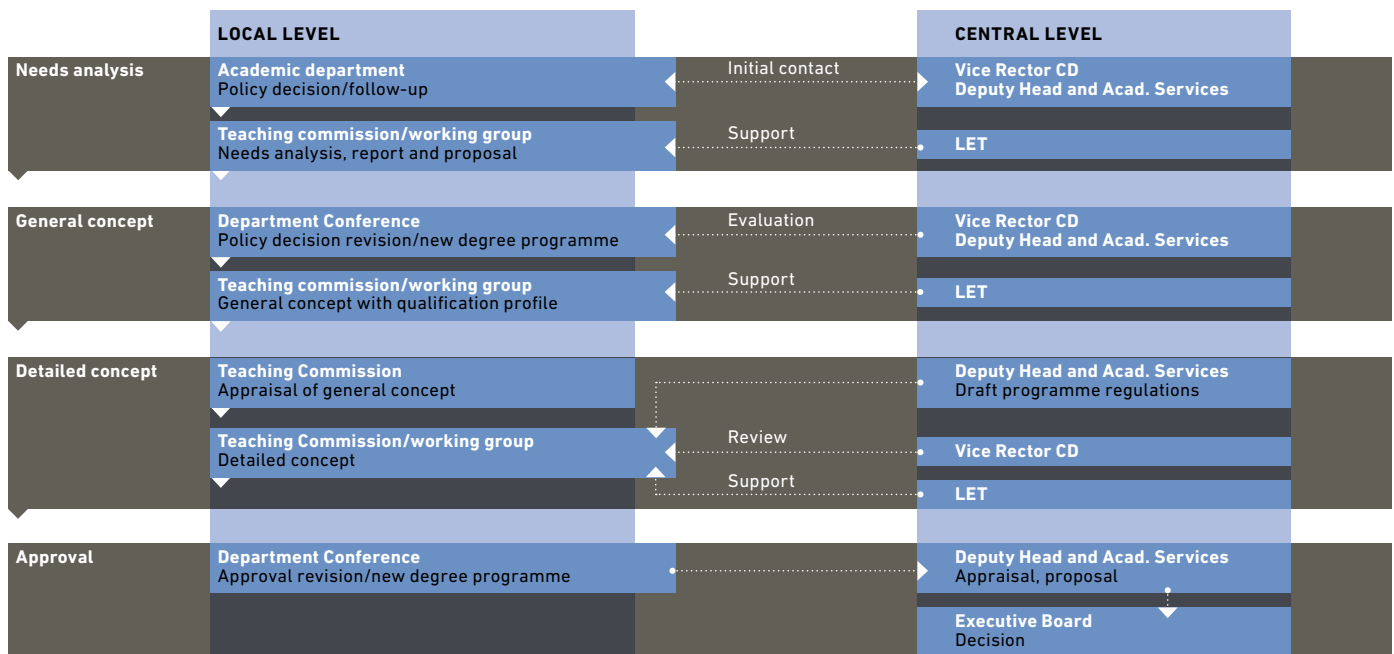
RETHINKING MOBILITY

ETH Week is a key project of the Critical Thinking initiative, which gives students the opportunity to analyse and reflect on important challenges facing society. In 2019, 200 students working in interdisciplinary teams addressed the topic of Rethinking Mobility, developing solutions and prototypes for the mobility of the future.

www.ethz.ch/ethweek

▼ Curriculum development involves revising an existing degree programme or developing a new one.

Curriculum development



CD = Curriculum Development LET = Educational Development and Technology

ESTABLISHING A CREATIVE SPACE

How is teaching at ETH dealing with the explosion of information in research and technology? Besides developing specialist knowledge, teaching is increasingly concerned with interdisciplinary skills such as critical thinking and the ability to filter, understand and apply relevant information.

By Ori Schipper

The massive growth in scientific knowledge thanks to research and technology over the last 30 years means that even acknowledged experts find it harder and harder to keep up. Against this background, doggedly stringing facts together and systematically turning students into walking encyclopaedias makes less and less sense.

"Of course it is painful to leave some things out, but teaching at ETH Zurich can no longer be an attempt to cover everything," says Andreas Vaterlaus, Professor of Physics and Vice Rector for Curriculum Development. "Treating a subject superficially without the students having the opportunity to apply their knowledge isn't much use." Vaterlaus surveys how teaching at the university is constantly changing so that it remains adapted to the current state of knowledge.

Important signals are provided by the teaching evaluation process, he says. When a lot of students complain that the material is too

dense and they don't have time to process the study content, this is often a sign that it's time to declutter.

ETH Zurich's teaching policy is designed to offer students a wide range of opportunities and freedom to achieve top performance – even outside of the scope of performance assessments and curricula.

"Many things happen at the level of individual courses that we don't notice at the central level," says Vaterlaus. But if major changes are planned or even entire degree programmes are redesigned, the Educational Development and Technology administrative department, the Education Legislation team and the Vice Rector for Curriculum Development are involved in the process from the very beginning.

The degree programme initiative provides departments with a tool which they can use to gain more financial leeway and time in which to develop new course content and ways of teaching. When an entire degree programme has to be restructured and rebuilt so that "no stone is

“We want to stimulate our students’ critical faculties by demonstrating the limits of our knowledge from the outset.”

Julia Vorholt

Degree programme
initiative coordinator:
“Biology according
to first principles”

left unturned”, this creates potential for something new. This is true, for example, of the two currently ongoing degree programme initiatives in materials science and biology.

Stronger weighting of engineering components

Materials sciences have made great strides since the turn of the millennium. The traditional separation of materials into different classes – metals, ceramics or polymers, for example – has become less important; now

initiative is to prepare students for the professional challenges of the future. This is to be achieved through a stronger weighting of the engineering and design components, whilst maintaining scientific rigour.

It helps to ask fundamental questions when reorienting a degree programme and to start by defining goals with a “qualification profile”, according to Vaterlaus. This goal orientation enables lecturers to avoid focusing too narrowly on their own subject area. “If, instead of asking whether I get two or three hours for my lecture, the focus is on the entire degree programme, this usually leads to a very constructive process of curriculum development.”

The department is now mid-way through the preparatory work. As early as Autumn Semester 2020, the materials scientists of the future will begin a revised degree programme with an entirely new structure. This not only combines skill sets from different courses, but also allows students working on engineering projects to find solutions to problems independently. “We want students to identify and address materials science questions starting with the product,” explains Morgenthaler. Since this is closely connected with the teaching of characterisation and processing methods, laboratories are currently being redesigned and adapted for teaching. This will give students early access to equipment used in research.

Taking evolution as the central theme

Autumn Semester 2020 will also see the launch of the newly designed Bachelor’s degree programme in biology. “We want to move away from our traditional focus on multicellular organisms such as plants and animals and reorient the degree programme towards the development of life,” said Julia Vorholt, Professor at the Institute of Microbiology and coordinator of the degree programme initiative “Biology according to first principles”. Taking evolution as the central theme allows us to base the teaching material on the historical development of organisms, and arrange it so as to enable students to focus more on the general principles and interconnections, whilst teaching less isolated, fact-based knowledge.

Up to now, the first year of the Bachelor’s programme has served mainly to refresh and standardise students’ varying knowledge acquired at school, so that central biological topics such as metabolism or heredity can be studied in greater depth in the second year. But today’s textbooks are written with too narrow a perspective. “Biochemistry mainly describes biochemical processes in a liver cell. This is only a small part of the life processes,” explains Vorholt. This focus on multicellular organisms makes it difficult to develop an understanding of evolutionary relationships.

Under the new programme, biology students now try to understand how life has developed from the beginning – about four billion years

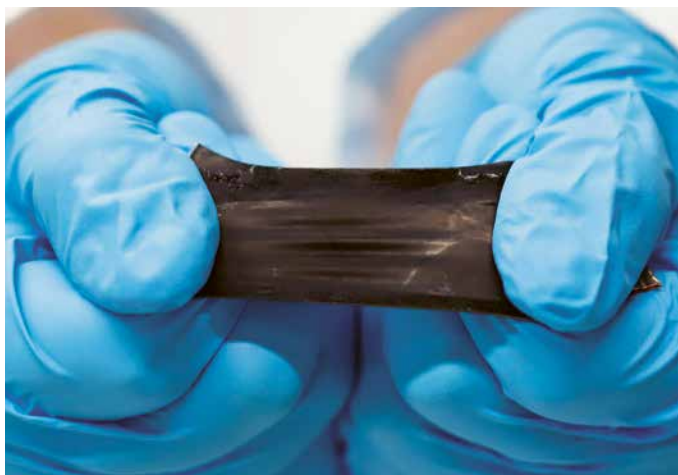


▲ In the new Quantum Engineering Master’s degree programme, students are immersed in the fundamental laws of quantum theory.

the focus is on global properties. For example, there is one professorship for complex materials and another for multifunctional materials. “We would like our Bachelor’s programmes to reflect this new interpretation of the subject area more clearly,” says Sara Morgenthaler, Head of Study and Doctoral Administration in the Department of Materials.

Discussions took place with lecturers and students, but also with alumni, other universities and companies, to identify what graduates should be able to do after completing their education. One aim of the Materials Redesigned

► New materials: this thin lithium-ion battery can be twisted, bent and stretched.



► The redesigned Bachelor's programme in biology establishes closer links than before with chemistry, physics, mathematics and computer science.



“We must keep developing our degree programmes if we are to continue giving students the tools to help shape the future.”

Andreas Vaterlaus

Vice Rector for Curriculum Development

ago – and the wide variety of solutions that life forms have developed in order to survive under the prevailing conditions.

Vorholt and her colleagues aim to base their teaching on the fundamental findings of the last 20 years, which shed new light on key biological questions. What is life, and what are the conditions and laws that govern it? “We hope to stimulate our students’ curiosity and critical faculties by raising unanswered questions from the outset, to demonstrate the limits of our knowledge,” she says.

The new degree programme will contain more interdisciplinary elements and will establish closer links with chemistry, physics, mathematics and computer science than has been the case up to now. It is planned to coordinate the study content for biology with that of the other subjects. “In raising these concerns we found we were pushing at an open door,” says Vorholt. This reciprocal, networked approach should make the other disciplines more relevant and exciting for future biologists.

“So, for example, a colleague from earth sciences will use their expertise to show what the earth would have looked like without life, and what dramatic changes to the earth have been triggered by biological processes,” explains Vorholt. “This should open students’ eyes

to the major connections from the very start of the programme, before getting into the molecular basis of life processes.”

Ground-breaking courses

In contrast to the two degree programme initiatives mentioned above, which are reorganising existing course content in order to incorporate current knowledge of the subject into teaching, the growth of knowledge in other areas is leading to the development of completely new courses. In Autumn Semester 2019, for example, the two federal institutes of technology ETH and EPFL launched the Cyber Security Master's programme. “This joint degree programme combines the strengths of our two universities in a field that is of vital interest to our country,” says ETH Zurich President Joël Mesot.

In this Master's programme, computer science students follow up their undergraduate studies by delving into aspects of cryptography and the security of hardware, software and networks. They also examine ways of ensuring user confidence. As well-trained specialists, they will one day help our increasingly connected society to guard against threats such as data theft or attacks on vital infrastructure.

The Master's programme in quantum engineering, also launched in Autumn Semester 2019, is similarly forward-looking. This course is open to students with Bachelor's degrees in physics or computer science and electrical engineering.

In a project-based learning environment in which mixed teams of engineers and physicists work together, they are taught both the basic laws of quantum theory and the engineering skills necessary to implement, measure and control quantum processes.

Vaterlaus sees these new opportunities at Master's level as enriching for students. The fact that teaching at ETH Zurich is constantly being reviewed through an ongoing process naturally involves a considerable amount of work for all concerned, and it also means that lecturers must always be prepared to take new ideas on board. But this is the only way to ensure that ETH students keep getting the right “toolkit” from their studies – in other words, that they learn all the skills they need to help shape the future.

www.ethz.ch/curriculum-development

▼ School for Continuing Education: with its continuing education programme, ETH contributes to the long-term development of the Swiss economy and society.



LIFELONG LEARNING

UNDERSTANDING TECHNOLOGY FOR MANAGERS

Teaching at ETH Zurich is not only about training people, but also about continuing education. It is understood as a process of transferring knowledge and technology between academia and practice, as demonstrated, for example, by the most recent MAS programme, the Master of Advanced Studies in Applied Technology. The course is aimed at experienced managers who work in technology-intensive sectors, but who have limited technical and scientific knowledge and want to gain

a better understanding of the problems that frequently arise in applied technology projects.

The two-year part-time programme uses interactive teaching methods that encourage lively discussions and cooperation among the participants. The MAS thus provides a framework for students to share their experience and expand their network of contacts – within and across sectors. The aim is not only to provide graduates with technological skills and an understanding of research and development processes, but also to enable them to recognise technology-based innovation opportunities in their companies and work out what, if anything, is preventing them from seizing those opportunities.

“This unique programme is designed as a kind of reverse MBA,” says Paolo Ermanni, Vice Rector for Continuing Education. “It allows participants to enrich their existing business management skills with technical and scientific knowledge.” This should allow them to communicate with technical specialists more precisely and efficiently after they have completed their training. A deeper understanding of technological applications should also help them to manage staff in their companies more effectively and efficiently, even in complex and demanding projects.

www.sce.ethz.ch/en

STUDENT SATISFACTION SURVEY

BASICALLY SATISFIED, BUT WORKING AT FULL STRETCH

In Spring Semester 2019, the Association of Students at ETH Zurich (VSETH) conducted a survey on equal opportunities and mental health among students taking Bachelor's and Master's degree programmes at ETH. A total of 6,400 students took part in the “#howsethgoing?” online survey, answering questions about their academic situation, mental health and experiences of discrimination or unequal treatment.

The results paint a positive picture in many respects. VSETH reported: “It is pleasing to note that in general students perceive ETH as a respectful environment.” However, many students find it difficult to deal with the heavy workload. Twenty percent of students responded that they did not cope well with the academic pressure.

The Rectorate is aware of this problem and pays particular attention to reducing the workload when reviewing degree programmes. “For some time now, we have been engaged in intensive discussions with all those responsible for teaching on how we can offer students more freedom in their curricula,” says ETH Rector Sarah Springman.

www.vseth.ethz.ch/howsethgoing

ETH SINGAPORE MONTH

LEARNING IN THE URBAN LAB

Students from 12 departments took part in the first ETH Singapore Month, a “classroom” more than 10,000 kilometres away from the Zurich campus. Their goal: to develop solutions to the complex problems facing the city state. These include the supply of clean drinking water, sanitation, reducing inequality and encouraging responsible consumption and production.

Participants examined different models of governance, as well as fundamental issues such as common definitions of equality, fundamental rights or boundaries.

At the end of the course, students from ETH Zurich, the Massachusetts Institute of Technology (MIT), the University of Cambridge and other institutions presented their ideas as part of an exhibition.

ETH Rector Sarah Springman comments: “At the end of the day, it is not about whether the proposals will be implemented tomorrow. Rather, it is intended as a learning experience for the leaders of tomorrow.” ETH Zurich aims to offer educational experiences that lift students out of their comfort zone, challenge their assumptions, stretch their imagination and dare them to dream the seemingly impossible.

▼ The first ETH Singapore Month: 48 students from 7 universities around the world took part.



STUDENTS AND DEGREE AWARDS

Students	Total		Bachelor's students		Master's students		Doctoral students		MAS / MBA students		Visiting / exchange students	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Headcount	21,397	22,193	9,517	9,895	6,590	7,037	4,175	4,168	635	626	480	467
Percentage women	32.3 %	32.9 %	32.7 %	33.1 %	31.0 %	31.1 %	32.1 %	33.5 %	43.1 %	42.3 %	30.8 %	38.1 %
Percentage international students	39.4 %	40.0 %	20.4 %	21.5 %	41.6 %	43.0 %	72.9 %	73.2 %	40.6 %	37.9 %	93.5 %	92.5 %
Total registrations	21,886	22,699	9,922	10,306	6,608	7,055	4,175	4,168	701	703	480	467
Architecture and Civil Engineering	3,574	3,586	1,723	1,739	1,209	1,205	422	422	125	138	95	82
Engineering Sciences	7,825	8,355	3,650	3,903	2,546	2,795	1,443	1,441	22	34	164	182
Natural Sciences and Mathematics	5,469	5,565	2,480	2,500	1,505	1,613	1,165	1,144	197	196	122	112
System-oriented Natural Sciences	4,085	4,281	2,026	2,124	1,008	1,107	865	878	118	112	68	60
Management and Social Sciences	933	912	43	40	340	335	280	283	239	223	31	31
New students	7,688	8,006	2,937	3,128	2,739	2,927	991	958	261	263	760	730
Architecture and Civil Engineering	1,145	1,184	463	456	381	444	97	93	61	66	143	125
Engineering Sciences	2,785	2,984	1,071	1,174	1,089	1,165	331	339	10	21	284	285
Natural Sciences and Mathematics	1,994	2,043	766	828	721	728	273	265	52	51	182	171
System-oriented Natural Sciences	1,444	1,451	626	652	452	475	220	197	37	28	109	99
Management and Social Sciences	320	344	11	18	96	115	70	64	101	97	42	50
Country of education												
Switzerland	14,278	14,754	8,544	8,823	4,059	4,253	1,178	1,161	458	477	39	40
EU	5,082	5,262	1,167	1,254	1,528	1,668	1,969	1,951	144	130	274	259
Rest of Europe	572	594	126	130	215	233	189	197	15	15	27	19
Asia	1,330	1,461	56	68	577	671	557	589	48	40	92	93
America	487	478	23	21	177	175	225	214	25	25	37	43
Africa	98	107	5	9	36	36	49	46	6	12	2	4
Australia and New Zealand	39	43	1	1	16	19	8	10	5	4	9	9

Degrees and diplomas	Total		Bachelor's		Master's		Doctorate		MAS		Teaching diploma/ MAS SHE		Teaching certificate	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Degrees	4,957	5,229	1,678	1,758	2,196	2,335	802	866	184	197	48	48	49	25
Architecture and Civil Engineering	844	884	281	307	410	421	94	84	59	72	0	0	0	0
Engineering Sciences	1,655	1,793	607	592	786	890	250	302	0	5	2	1	10	3
Natural Sciences and Mathematics	1,264	1,308	425	442	559	565	238	267	14	0	25	31	3	3
System-oriented Natural Sciences	942	972	349	397	359	361	172	167	5	12	21	16	36	19
Management and Social Sciences	252	272	16	20	82	98	48	46	106	108	0	0	0	0



A TEACHING OVERVIEW

HAVING INFORMATION AND KNOWING WHAT TO DO WITH IT

ETH Zurich trains outstanding specialists in their fields and prepares its students to assume positions of responsibility as critically engaged members of society.

The range of courses offered at ETH Zurich is constantly evaluated and developed in order to prepare students for the professional challenges of the future. The portfolio of degree programmes is geared to the long-term needs of science, society and the Swiss economy. In 2019, two major initiatives were launched to restructure the materials science and biology degree programmes based on the current state of knowledge in those subjects (see pages 16 to 18).

The development of the Bachelor's degree programme in geospatial engineering is an example of how we are reforming our curricula. Larger course units offer more scope for course design and for the teaching of interdisciplinary skills such as critical and holistic thinking. The programme also provides access to two consecutive Master's degree programmes. A Master's programme in quantum engineering was also launched in Autumn Semester 2019. It has a strongly project-oriented learning component, which requires active participation in industrial and scientific research projects.

As part of the digital development of teaching and learning, ETH is taking on board the changing learning and teaching needs of students and lecturers and offering innovative solutions. In 2019, the number of online examinations per semester increased to around 150 examinations being taken by 12,000 students, compared to around 120 examinations being taken by 10,000 students in the previous year. A project on examinations with mobile devices was also successfully completed, and its results are now being integrated into the online exams service.

This allows examinations to be conducted on the university's own laptops via wi-fi in the seminar

rooms and lecture halls, alleviating capacity bottlenecks in the available computer rooms during examination periods.

ETH Zurich is constantly optimising the **recruitment process**, particularly at the Master's and doctorate level. In 2019, as part of the Redefining Master's Admission project, the Executive Board approved the admission principles for Master's programmes: ETH Zurich stands for excellence in teaching and research. It trains its students to become skilled and entrepreneurially minded employees and managers for science, the globalised economy, industry and the society of the future. Internationalism and diversity create an inspiring ETH community that enables intercultural learning and ensures fulfilment of the educational mission in both qualitative and quantitative respects. Our own Bachelor's graduates go on to make up the majority of our Master's students.

Attracting excellent candidates from Switzerland and all over the world promotes intellectual debate between students, encourages scientific discourse and enhances our own recruitment pool for doctorates and research. ETH Zurich welcomes suitable applicants. Admission to the Master's programme should be actively managed in order to guarantee the high quality of the education we offer: selection is based on performance, potential and capacity.

The process of **admitting and supervising doctoral students** is also being improved.

In early 2019, Vice Rector for Doctoral Studies Antonio Togni held an international symposium on doctoral supervision, which also met with great interest within ETH. In addition, the Executive Board adopted a comprehensive package of measures for the further development of doctoral studies. The Ordinance on Doctoral

Studies is undergoing revision based on the opinions of departments and university groups.

The focus here is on improving admission and support processes.

ETH Zurich reformed its **scholarship system** in 2019, with the result that, since Autumn Semester 2019, more scholarships are being awarded and the amounts paid out have increased. In this way, the university is compensating less well-off students for the increase in tuition fees decided by the ETH Board in 2018.

The **range of continuing education courses** is being selectively expanded and geared to the needs of alumni, the economy, government and society. Many continuing education programmes at ETH Zurich serve niche areas where there is a gap and where the university can contribute its strengths.

Until now, for example, there has been no provision for people with an economics or social science background who wish to acquire technical and scientific knowledge for their work in technology-oriented companies.

In addition to the Master of Advanced Studies in Applied Technology, which was launched in 2019 (see page 19), ETH Zurich has developed three new CAS programmes in collaboration with industry partners, which will be held for the first time in 2020.

A female researcher with reddish-brown hair tied in a bun, wearing a white lab coat, is shown in profile. She is holding a tablet with her right hand and looking at the screen. The background is a laboratory with various pieces of equipment, including a large black machine with red and white cables. The scene is brightly lit, likely from windows with blinds in the background.

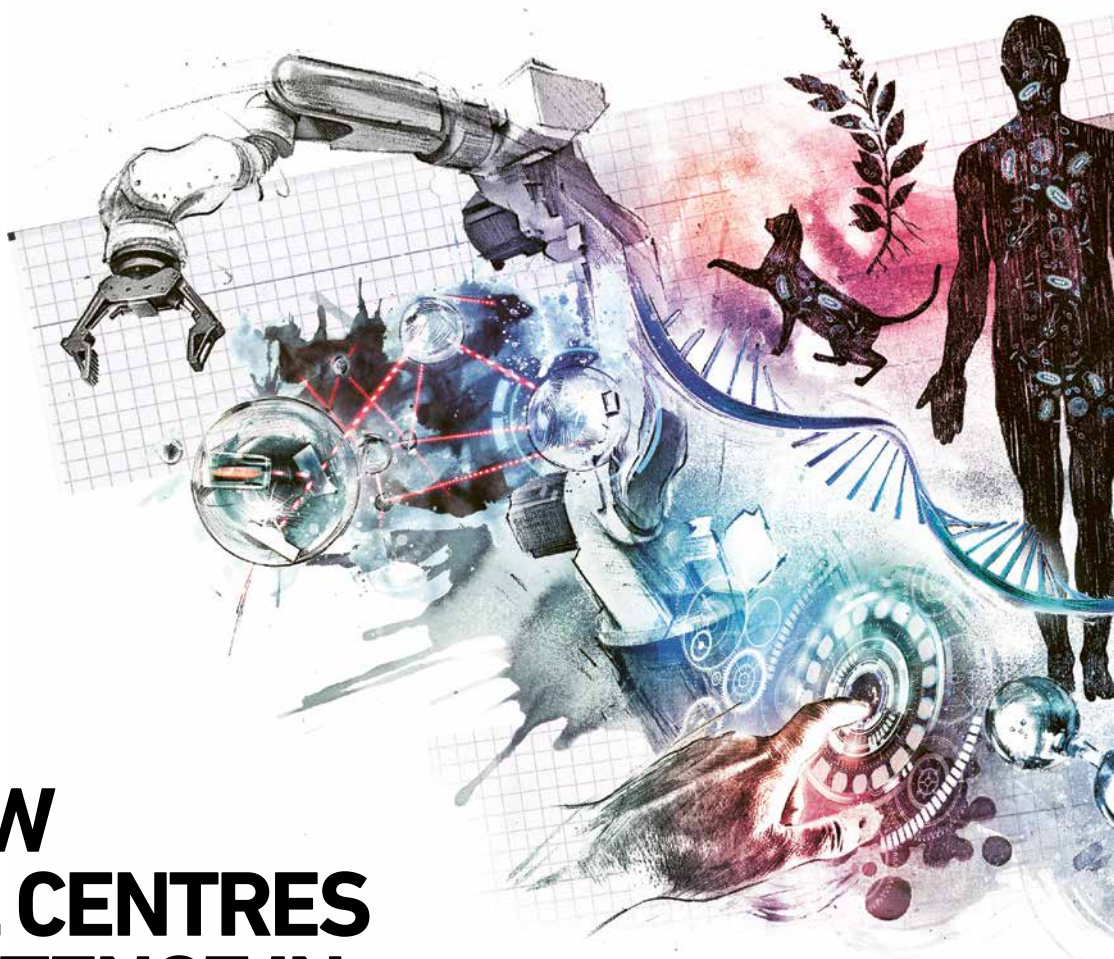
Research at ETH Zurich provides the basis for future innovations and the development of our society. Thanks to its modern infrastructure and highly qualified staff, ETH Zurich is able to conduct basic and applied research at the highest level and make advances in the strategic priority areas of healthcare, data sciences, sustainability and manufacturing technologies. Technology platforms and centres of excellence support collaboration; internal research funding creates the conditions for outstanding performance.

RESEARCH

RESEARCHING TOMORROW'S NUTRITION

In 2019, ETH Zurich and EPFL launched the Future Food Initiative together with various industrial partners. The initiative supports research in the food and nutrition sciences, thereby promoting sustainable food production. The initiative is centred around a funding programme that aims to attract talented scientists from Switzerland and abroad to take part in research and innovation projects in Switzerland.

www.futurefoodtalents.org



THREE NEW NATIONAL CENTRES OF COMPETENCE IN RESEARCH FOR ETH

At the end of 2019, the Swiss Federal Council announced that, from 2020, ETH Zurich will be the Leading House for three new National Centres of Competence in Research. The long-term programmes cover socially important research topics. These concern the automation and digitalisation of industry and society, new approaches to sustainable chemistry, and the influence of bacteria on health.

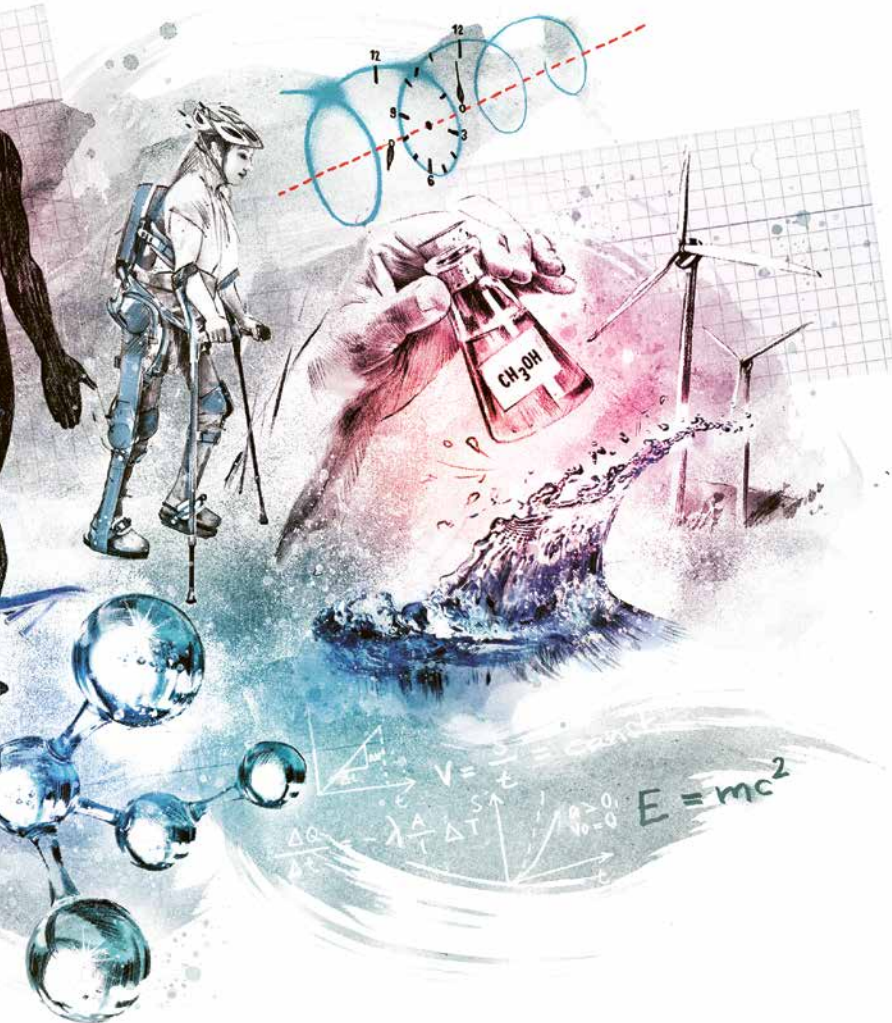
By Santina Russo

Approximately two years of preparatory work have paid off: researchers at ETH have been appointed as Leading House for two new National Centres of Competence in Research (NCCRs) and co-lead for another in collaboration with the University of Lausanne. ETH is therefore involved in three out of six of the new NCCRs.

"All three of the new NCCRs research topics are of major social relevance and also make important contributions to solving global challenges," says Dettlef Günther, Vice President for Research and Corporate Relations. Like the seven NCCRs already operating under the leadership of ETH Zurich, the three new centres are also designed to support interdisciplinary cooperation and accelerate teaching, research and transfer activities.

Moving away from oil-based chemistry

One of the recently approved projects is aimed at finding new kinds of non-oil-based chemical processes. "Chemical products play an essential role in our modern everyday lives, but too many of them are still based on fossil fuels that we will no longer be able to rely on in the future," says Javier Pérez-Ramírez, Professor of Catalysis Engineering at ETH Zurich and director of the new Catalysis NCCR (Sustainable Chemical Processes through Catalysis). The research effort is therefore intended to help industry convert to more sustainable chemical processes.



▲ From digital fabrication to quantum technology, from RNA biology to sustainable chemical processes – ETH participates in ten different National Centres of Competence in Research.

Automation, the second NCCR under ETH management, is also thinking ahead: today, many machines, processes or networks in industry and society can already be controlled automatically without human intervention. In the future, automation is likely to extend to the control of cities, power grids and industrial processes. “The main emphasis of Automation is dependable and ubiquitous automation,” explain Gabriela Hug, professor at the Power Systems Laboratory, and John Lygeros, professor at the Automatic Control Laboratory, who jointly lead the NCCR. “As automation continues to advance in industry and society, its success and acceptance will depend heavily on its reliability.”

The third new NCCR with ETH participation researches how bacterial colonies affect the health of humans, animals and plants. “Microbiomes” is jointly headed by Jan Roelof van der Meer, Professor of Environmental Microbiology at the University of Lausanne, and Julia Vorholt, Professor of Microbiology in the Department of Biology at ETH Zurich. The aim of the NCCR is to identify the principles that govern communities of microorganisms, so-called microbiomes, across biological systems. They often consist of up to several hundred types of bacteria that interact with each other, with their hosts and with the environment.

Building for the future

As well as the new NCCRs, ETH already participates in a number of successful Centres of Competence. For

NATIONAL CENTRES OF COMPETENCE IN RESEARCH

The National Centres of Competence in Research (NCCRs) are Switzerland’s largest and most long-term research funding instrument. The Swiss National Science Foundation uses them to support outstanding scientific research projects of key strategic importance for Swiss industry, science and society. There are currently 22 such centres. ETH is involved in ten of these NCCRs as Leading House or Co-Leading House. Besides conducting scientific research, the projects always involve the transfer of knowledge and technology, and activities and support for women and junior researchers. At the same time, the NCCRs dovetail with the strategic priorities of ETH and support the university’s development

example, it acts as the Leading House for the Digital Fabrication (DFAB) NCCR established in 2014.

This project brings digital technology to the construction site. Take, for example, the In situ Fabricator, a construction robot that can autonomously construct steel reinforcements for concrete walls, build with wood and bricks, and even weld.

The NCCR built the DFAB HOUSE, the world’s first habitable house fabricated using mainly digital solutions.

Research on the smallest scale

ETH Zurich also leads two other National Centres of Competence in Research, both of which have been running since 2010/11, namely MUST and QSIT. Both conduct research on the smallest scale. MUST (Molecular Ultrafast Science and Technology) seeks to measure and understand the fastest energy and charge transports that occur. QSIT (Quantum Science and Technology), the Centre of Competence that has made ETH Zurich the world’s leading university for quantum technology, is also pushing the boundaries of what is possible. The NCCR follows a broad approach and conducts research on a variety of currently competing quantum technologies.

Also, ETH Zurich has already been involved for several years in four other NCCRs as Co-Leading House: Engineering of Molecular Systems (MSE), Mathematics of Physics (SwissMAP), Robotics, and RNA & Disease. ETH is now the Leading House or Co-Leading House for a total of ten National Centres of Competence in Research.

Günther is delighted to see the enthusiasm with which ETH researchers are taking on responsibility for complex and socially important research topics: “The Centres of Competence attract young, talented researchers, have a significant long-term impact in their respective fields and embrace interdisciplinary approaches to resolving complex challenges, from basic research to implementation.”

www.ethz.ch/nccr
www.ethz.ch/nccr-2020

NEW FUNDING INSTRUMENT

ETH PROMOTES INTERDISCIPLINARY RESEARCH

Since 2019, ETH researchers have benefited from two new internal funding instruments. First, there are ETH+ grants, which are intended to support expressly interdisciplinary research. These projects must involve several researchers from at least two disciplines, preferably from different departments. This makes it possible to combine different lines of research, share skills and develop new approaches.

Two projects have already received ETH+ grants, most recently a project led by ETH Professor Sean Willett, in which researchers from the fields of geology, biology and environmental science are jointly investigating how landscape, tectonics and climate influence biodiversity.

2019 also saw the launch of "Future Food Fellowships". Here, ETH and EPFL work with industrial partners to support postdoctoral researchers who are studying how our food supply can be made more sustainable. Can old plant varieties be used to produce new packaging materials? How can plant substances be used to counteract obesity? These are just two of the questions that talented young researchers are now able to address thanks to this funding instrument.

▼ Through ETH+, ETH Zurich supports selected ideas from its employees, opening up new subject areas in the process.



NEW ETH+ PROJECTS

BUILDING BRIDGES THANKS TO ETH+

The goals of the selected ETH+ initiatives are highly ambitious: they range from turning ETH Zurich into a pioneer in the field of information security, developing it into a global centre for educational research and creating revolutionary cardiovascular therapies, to using technologies for sustainable development cooperation.

To realise these aspirations, the ETH Executive Board launched the ETH+ funding instrument in 2017. The second and third calls for entries in this competition for ideas, in which all members of ETH Zurich can take part, were announced in 2019.

In the second round, a total of 241 ETH employees submitted

25 outlines of ideas, building numerous bridges across disciplinary and organisational boundaries.

"ETH+ has developed an unbelievably positive dynamic," says ETH President Joël Mesot. So far, 14 of the ideas submitted have been selected for implementation.

The goal of ETH+ is to maintain and expand ETH's leading position through structural development. With this in view, existing priorities can be strengthened and new subject areas opened up. Specifically, this means establishing new professorships, centres or technical infrastructures.

It can also involve new continuing education formats and study programmes, as in the first ETH+ project designed by students: this seeks to establish a new interdisciplinary degree programme that will provide future engineers with an interdisciplinary training geared to the job market.

www.ethz.ch/ethplus-en



▲ ETH President Joël Mesot welcomes guests to the event in Singapore.

SINGAPORE-ETH CENTRE

THE FUTURE OF MEDICINE

Digitalisation is increasingly changing the face of medicine, and doing so rapidly: sensors measure the human body, smartphones analyse health data and sound the alarm if necessary, while robots and exoskeletons help patients to perform movements. To apply such technologies successfully, it is essential to involve health professionals at an early stage.

"Otherwise, there is little chance the devices will be used by patients in hospital and even less at home," explains Margrit Leuthold, coordinator at the Singapore-ETH Centre SEC. This is a risk, for example, if mobile sensors work perfectly well technically, but are uncomfortable for patients to wear.

This is where "Future Health Technologies" comes in, a new programme approved in 2019 which will be developed at the SEC starting in 2020. Under the programme, ETH researchers work closely with colleagues from partner universities and hospitals in Singapore. The aim is to introduce technologies into patients' everyday lives at all stages of treatment – from the intensive care ward to the home environment – in order to improve the early detection, prevention and treatment of diseases. The programme will focus particularly on diabetes, depression, strokes and falls, which are rapidly increasing in ageing societies such as those in Singapore and Switzerland.

www.sec.ethz.ch
www.fht.ethz.ch

PROMOTING TOP-LEVEL RESEARCH IN EUROPE

In 2019, ETH researchers were again successful in their applications for the prestigious grants awarded by the European Research Council (ERC). Funds totalling around 68 million Swiss francs were raised in 2019. New records were set in two areas: 15 applicants obtained Starting Grants, and 3 Synergy Grants. ETH Zurich's success rate for all grants is above the European average.

SYNERGY GRANTS

Synergy Grants are awarded to teams. ETH researchers are leading two of the three award-winning projects.

Professor Domenico Giardini and Professor Stefan Wiemer, both D-ERDW, as well as researchers from the RWTH Aachen University and the Istituto Nazionale di Geofisica e Vulcanologia in Italy, want to gain a better understanding of the physics of earthquakes and improve earthquake predictions. The findings will also be used to drive forward experiments on the use of geoenery.

Professor Jacob Corn, D-BIOL, the University of Cambridge and the Research Centre for Molecular Medicine of the Austrian Academy of Sciences are using gene editing and chemical biology to determine how cells repair damage to their DNA. The scientists hope that this will lead to new approaches for the treatment of cancer.

Professor Jeffrey Bode, D-CHAB, in collaboration with the Friedrich Miescher Institute for Biomedical Research in Basel and the University of Bristol, is investigating the molecular mechanisms of viral infections in order to develop new kinds of broad-spectrum antiviral therapies.

ADVANCED GRANTS

Advanced Grants support established researchers, enabling them to carry out large projects in collaboration with other researchers in Europe.

Professor Andy Jackson, D-ERDW, aims to investigate dynamo mechanisms that generate magnetic fields in the cores of rocky planets and gas giants. He is developing a computer model that simulates reversing dynamics and wants to be able to predict the future development of the Earth's magnetic field more precisely.

Professor Dirk Helbing, D-GESS, is investigating what is needed to make smart cities more efficient, sustainable and resilient. He is looking at the benefits and risks of greater democratic participation and seeing how far a decentralised, participatory approach can be more sustainable than a more centralised approach.

Professor Erick Carreira, D-CHAB, is developing chemical reactions to attach functional groups to certain molecules in a way that controls asymmetry. These groups allow the molecules to be used in sustainable processes.

Professor Ilya Karlin, D-MAVT, is investigating flows that occur at high speeds and with strong temperature variations, for example on a space capsule's re-entry to the earth's atmosphere. Simulations of this process should help to make space travel safer.

Professor Peter Chen, D-CHAB, is conducting a quantitative study of the London dispersion force that acts between two polarisable molecules. He is developing measuring instruments and special molecules to analyse this attraction force.

CONSOLIDATOR GRANTS

Consolidator Grants help researchers to build up their research groups. The grants are worth around EUR 2.2 million on average.

Professor Emma Wetter Slack, D-HEST, is developing vaccines to protect against infections with pathogenic intestinal bacteria. Such antibody-based vaccines would be of interest for use in both humans and farm animals.

Professor Paola Picotti, D-BIOL, plans to use "big data" and classical molecular biology approaches to find out whether protein structures in biological specimens can serve as a data set. In this way, pathological changes could be detected and explanatory models developed.

Professor Sebastiano Cantalupo, D-PHYS, is using the most advanced telescopes to obtain a direct picture of the "cosmic web". He will compare the measurement data with new models to address fundamental questions for our understanding of the universe.

Professor Stelian Coros,
D-INFK, will use additive manufacturing and develop computational and mathematical principles to design new, lifelike robots. They are inspired by the way form and function interact in the animal kingdom.

STARTING GRANTS

Starting Grants help researchers to establish themselves at the beginning of their careers. In 2019, 15 of these grants were awarded to ETH researchers – a new record.

Dr Daniel Ahmed,
D-MAVT, wants to develop small robots that can be controlled via both ultrasound and magnetic fields. One day these miniature shuttles will be able to navigate through the bloodstream and deliver drugs precisely where they are needed.

Professor Ueli Angst,
D-BAUG, is studying electrochemical processes that protect steel-based infrastructure against corrosion. He will combine various methods with the modelling of transport processes in porous media.

Dr Kristy Deiner,
D-USYS, is seeking to monitor biodiversity in fresh water and on land using novel genetic technology. This will allow the detection of different species from DNA traces in the environment.

Professor Daniela Domeisen,
D-USYS, is investigating the drivers and predictability of heatwaves. Domeisen applies a model hierarchy approach in order to extend predictable lead times through a better understanding of heatwaves.

Professor Mohsen Ghaffari,
D-INFK, plans to tackle key problems in distributed graph algorithms. He is developing massively parallel algorithms that should enable a group of computers to solve large-scale problems efficiently.

Professor Marco Hutter,
D-MAVT, aims to apply machine learning methods to enhance the mobility of quadrupedal robots and prepare them for autonomous locomotion in difficult terrain such as disaster areas, sewers or minefields.

Professor Victor Mougel,
D-CHAB, plans to develop a more energy-efficient and carbon-neutral method for producing ammonia. He is developing a new class of electrocatalysts based on the functional principle of a natural enzyme.

Professor Randall Platt,
D-BSSE, plans to develop a type of sentinel cell with a built-in biological data logger which can monitor and record biochemical processes in the intestine for medical diagnostic purposes.

Dr Sebastian Schemm,
D-USYS, wants to investigate the physical principles which underlie the almost chaotic variability of the atmosphere. He also plans to examine the role of clouds, convection, radiation and turbulence in the formation of unusual atmospheric conditions.

Dr Thomas Schutzius,
D-MAVT, is conducting a study to determine how limescale forms in boilers and hot water pipes, and which surfaces can prevent the deposit of calcium and other minerals through intelligent interaction between their material and their structure.

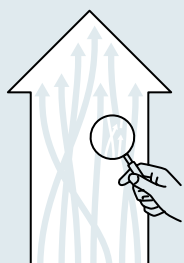
Professor Chih-Jen Shih,
D-CHAB, aims to control the movement and orientation of electrically neutral excitons in nanomaterial assemblies. This could increase the efficiency of electricity-to-light conversion, for example in LEDs.

Dr Veerle Sterken,
D-PHYS, is studying how our solar system has evolved over time on its journey through our galaxy and how other stars in our immediate interstellar neighbourhood interact with their surroundings.

Professor Vincent Tassion,
D-MATH, is investigating fundamental questions of percolation processes by establishing new connections between percolation theory and other fields of mathematics or theoretical computer science.

Professor Laurent Vanbever,
D-ITET, aims to automatically synthesise provably correct network controllers. Automating critical aspects of network operations will make networks more dependable and efficient.

Dr Maksym Yarema,
D-ITET, is to study nanodimensional phase-change materials and memory devices prepared using low-cost, material-efficient, liquid-based fabrication processes.



RESEARCH OVERVIEW

BETWEEN LAISSEZ-FAIRE AND STRUCTURAL DEVELOPMENT

Higher education policy in the area of research is shaped by the interaction between researchers' own initiatives and the university's main focus areas.

Core values of ETH Zurich include autonomy and a culture of empowerment, which are particularly fostered in research.

The resulting freedom provides motivation, ensures diversity and is supported by central measures. Other cornerstones of ETH Zurich's research strategy are the university's strong position in **basic research**, the interlinking of different disciplines through **interdisciplinary and interdepartmental cooperation**, and **support for young scientists**.

The main mechanism for implementing the goals set out in the university's Strategy and Development Plan 2017–2020 is **professorship planning**. This is developed jointly by the academic departments and the Executive Board. Besides developing the strategy, it also looks for opportunities to attract talent. A total of 50 new professors were appointed in 2019, most of them related to the main focus areas of research at ETH: 15 for Data, 13 for Medicine, 8 for Sustainability and 2 for Manufacturing Technologies.

ETH's **internal research support** also provides major incentives. Two new funding instruments were introduced in 2019 (see page 26): ETH+ grants support major interdisciplinary projects with up to 3 million Swiss francs each, and the Future Food Initiative is aimed at postdoctoral researchers working on sustainable solutions in nutritional science. In 2019, the total amount of grants awarded by ETH for internal funding of projects and individuals came to around 20 million francs. Thirty excellent postdocs from other institutions were attracted to ETH by the ETH Zurich Postdoctoral Fellowships programme.

An orientation event for new postdocs was held for the first time in 2019. This was a great success and

will therefore take place regularly from 2020 onwards.

As well as funding projects and individuals, ETH Zurich also supports the procurement of scientific equipment – a mainstay of research at a technical university – through the Scientific Equipment Programme. Investments in a wide range of technical infrastructure to the tune of around 14 million Swiss francs were approved in 2019.

An activity closely linked to strategic planning is the **support for major cross-departmental initiatives and centres**. The research platform ReMaP (Renewable Management and Real-Time Control Platform), for example, which started operations in 2019 and brings together ETH, PSI and Empa, makes an important contribution to the focus area of Sustainability (see page 13). The same is true of the Future Resilient Systems programme, which is established at the Singapore-ETH Centre (SEC) and was extended for a further five years in 2019. Another new SEC initiative that increases the focus on medicine is the Future Health Technologies programme (see page 26). This programme was approved in 2019 and will provide a framework for research into the role of technology in areas such as prevention and rehabilitation. A new centre of excellence, the Rehabilitation Engineering and Science Centre (RESC), is also part of the focus on medicine.

The diversity of research as well as social trends highlight ETH Zurich's duty to pay particular attention to **research ethics**. The relevance of this topic is demonstrated, for example, by the work of the Ethics Commission of ETH Zurich, which in 2019 again received a record number of applications and assessed a total of 185 studies. To promote knowledge and awareness

of this area among ETH Zurich researchers, two new online tools for self-study were introduced in 2019: the ETHics Resource Platform, launched by the Rector and directed towards doctoral students, and e-Learning Compliance, which is primarily aimed at professors. ETH improved communication of its implementation of the DORA principles and presented its position on Open Science, and especially Open Data, to national committees.

In the **operating business**, development of the web-based platform "eResearch" started in 2019. This is intended to bring together existing tools for the administration of research funding, infrastructure funding and ethics applications, and thus make processes more efficient and user-friendly. There was also a comprehensive relaunch of the research area of the website, where communication is now tailored more effectively towards the intended audience.

AI AGAINST DEFORESTATION

ETH for Development (ETH4D) develops innovative approaches to combating global poverty and trains future leaders who are committed to sustainable global development. As part of this ETH-wide initiative, the EcoVision Lab (left) and chocolate producer Barry Callebaut (right) are working together to use artificial intelligence and satellite images to halt deforestation in producing regions.

www.eth4d.ethz.ch



INDUSTRY AND SOCIETY



For ETH Zurich, an important part of social responsibility is maintaining an open dialogue, because complex issues require the sharing of information between science, industry and society. In this way, the university makes socially relevant research topics accessible to a broader public and the campus becomes a venue for public debate and information events. It specifically supports the transfer of scientific findings to industry and fosters scientific collaboration with national and international corporations and SMEs.



INNOVATING TOGETHER

ETH Zurich works closely with industry. There is increasing emphasis on collaborations with small and medium-sized enterprises.

By Martin Bornhauser

Grinding rail tracks as efficiently as possible or preventing bacteria in salmon farms from producing molecules that cause unpleasant odours – these were among the innovations that ETH Zurich researchers worked on with partners from industry during 2019.

They were supported by Innosuisse, the Swiss Innovation Agency. The successor to the Swiss Federal Commission for Technology and Innovation (CTI), Innosuisse finances science-based innovation projects carried out by research institutions and companies.

"Innosuisse is an important partner for ETH Zurich," says Silvio Bonaccio, Head of ETH transfer. In 2019, the Innovation Agency approved 25 applications from ETH, resulting in a success rate of around 61 percent. Applications are assessed by experts from Innosuisse.

If the assessment is positive and the Innovation Council approves the project, the agency pays half the project

◀ Environmental microbiologist Mark Lever and his doctoral student Pascal Wiesli (centre and left) share ideas with a partner from industry.

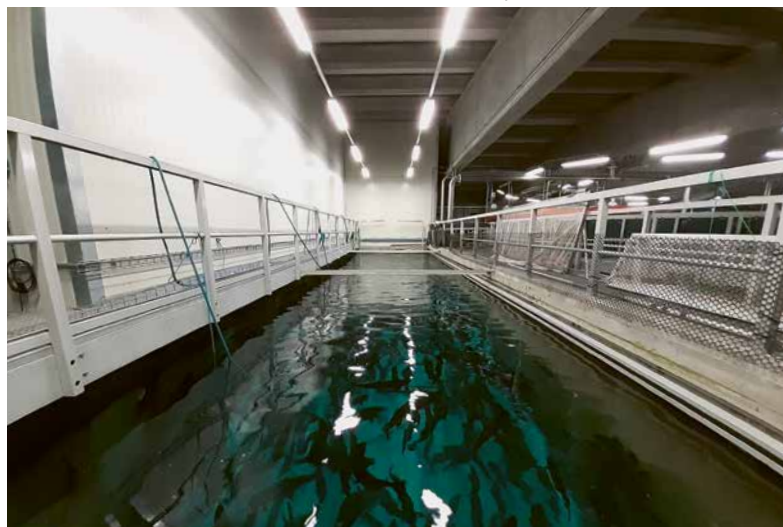
amount to the research partner, with the rest being paid by the participating company itself.

Industry Relations Manager Jan Zimmermann is also a fan of Innosuisse: "Our researchers are keen users of Innosuisse's services," he says. This is particularly true of established researchers who have a broad network of contacts with industry. Innosuisse is particularly involved in promoting innovation in SMEs, a goal that ETH Zurich is also pursuing. "Over 30 percent of ETH Zurich's projects with industry involve SMEs," says Zimmermann, emphasising the importance of research cooperation with small and medium-sized enterprises.

From rail transport to salmon farming

In the rail grinding project mentioned earlier, ETH Zurich's Institute of Machine Tools and Manufacturing works with Scheuchzer Ltd, which manufactures track-laying machines and "grinding trains". The background to the innovation project is that many lines of the Swiss rail network are exposed to heavy use, which means that the rails have to be ground regularly. The work has to be carried out as quickly and efficiently as possible so as not to impede railway operations. A grinding train currently has to make several passes over the rail when carrying out this re-profiling work. In future, grinding trains will only have to pass over the track once, thanks to the improved grinding process developed by ETH and Scheuchzer Ltd.

Researchers and industry are also working together on a project which aims to find out why bacteria in salmon farming produce molecules that cause odour emissions. Mark Lever, Assistant Professor in the Department of Environmental Systems Science at ETH Zurich, is taking part in the project, while Professor Lever's doctoral student Pascal Wiesli from the Zurich University of Applied Sciences (ZHAW) conducts experiments in Wädenswil.



▲ Sustainable salmon farming: Swiss Alpine Fish Ltd. in Lostalio feeds the fish without the use of chemicals or antibiotics.

The industrial partner is Swiss Alpine Fish Ltd. in Lostalio. While the fish are sustainably bred and fed without the use of chemicals or antibiotics, bacteria in biofilms in the water produce the alcoholic molecule geosmin.

"This molecule smells musty and its concentration in the water correlates with that in the salmon flesh," says Professor Lever. The unwanted odour reduces the price salmon fetch on the market.

"We are therefore looking to see which factors lead to bacterial production of geosmin." Tests have shown that

▼ To ensure that rail traffic is affected as little as possible when grinding rails, ETH researchers are working with a grinding train manufacturer to optimise the grinding process.



the choice of feed has an influence. "UVC radiation and the addition of ozone also change the geosmin concentration in the water," explains Lever.

Bridging the gap between research and application

The Bridge programme offered jointly by Innosuisse and the Swiss National Science Foundation builds a bridge from research to application. On the one hand, it supports junior researchers who want to test ideas to see whether they are feasible in reality. On the other hand, it can also benefit experienced researchers who want to put an innovation into practice.

In 2019, Volker Bartenbach was one of several members of ETH Zurich to benefit from Bridge. A Pioneer Fellow working in the Rehabilitation Engineering Laboratory, he launched a research project at ETH Zurich to develop exoskeletons for industrial applications. The wearable support systems are designed to protect the back during activities that put strain on the body, such as lifting and carrying heavy loads. With funds from Bridge, it is planned to spin off the research project from ETH Zurich.

ETH Zurich has a great deal else to offer companies and members of the university to promote cooperation between research and industry. The university's Industry Relations team provides special services for SMEs and supports companies and researchers submitting applications to Innosuisse. The Industry Relations offering includes a newsletter published every two months containing information about current ETH projects with industrial partners as well as events for industry. ETH transfer also helps researchers to draw up research contracts and patent their ideas.

ETH TRANSFER

TRANSFER OFFICE WINS AWARD

ETH transfer, the technology transfer office of ETH Zurich, won the award for Tech Transfer Unit of the Year from *Global University Venturing* magazine (GUV). This marked the first time the award was given to an institution outside the USA or UK, which indicates the highly successful and internationally competitive nature of technology transfer at ETH Zurich.

In particular, the efficient transfer of technology via ETH spin-offs gained recognition: with 30 new spin-offs in 2019, ETH Zurich was again able to increase the number of start-ups compared with the previous year. Detlef Günther, Vice President for Research and Corporate Relations, is delighted with the number of spin-off companies: "For ETH it is crucial that promising technologies and ideas arising from basic research are translated into businesses with high growth potential, thus creating new jobs."

ETH IN DAVOS

RETHINKING DESIGN

For the third time, ETH Zurich was present at the World Economic Forum (WEF) in Davos. Under the slogan Rethinking Design, the public science exhibition in the rooms of the Davos Hockey Club was dedicated to the question of how people should design their living space in the future and which materials could play a role in this.

The spectrum of exhibits ranged from game design, to a virtual reality tour of the Robotic Fabrication Lab, to new materials – for example, an "artificial tree" that converts CO₂ and light into solar fuel, lightweight fibres that can replace steel cables, or a new material that can be used to build computers in the future. The audience was as varied as the programme. School pupils met ETH alumni and local people met prominent figures from the worlds of politics, business and culture.

The star of the show was undoubtedly the four-legged, cat-sized, 3D-printed Skaterbot. It meandered slowly but not inelegantly across the ice in front of the pavilion, teaching itself to move on skates – thanks to artificial intelligence.

ETH organised numerous events for invited guests in its pavilion before, after and between the exhibition opening times. The first was a panel discussion entitled, "The Ethical Imperative". Chaired by Magdalena Skipper, editor-in-chief



of the journal *Nature*, Jean-Pierre Bourguignon from the European Research Council, Brian P. Schmidt, Nobel Prize winner and President of the Australian National University, and ETH Professor Gabriela Hug spoke about the necessity and feasibility of a code of ethics in science.

Other panels, organised with the support of companies such as Microsoft and Google, addressed the research area of artificial intelligence, which is central to the future of humanity.

▲ ETH alumni venture into a new reality at the exhibition.

▲ The Skaterbot takes to the ice – teaching itself to skate.

150 YEARS OF THE ALUMNI ASSOCIATION

CONNECT, ENGAGE, INSPIRE

The ETH Alumni Association celebrated its 150th anniversary in 2019. When it was founded in 1869, the then association of former students of the Swiss Federal Polytechnic School adopted statutes committing the association to work for the good of the school, cultivate relations among former students and support them in their professional interests. This still applies today. With its motto "Connecting – Engaging – Inspiring",

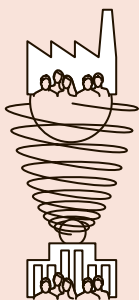
the association endeavours to maintain and expand the global network of ETH alumni. Today, the association has over 30,000 members who represent ETH Zurich as ambassadors all over the world.



▲ In May the alumni association celebrated its 150th anniversary.

IN DIALOGUE WITH INDUSTRY

At ETH Zurich's annual Industry Day, ETH researchers have the opportunity to present their work to businesses and people from industry and make useful contacts. In 2019, nearly 30 speakers and a record 80 exhibitors – including many new professors – took the opportunity to engage in dialogue with around 500 industry representatives.



OVERVIEW OF INDUSTRY AND SOCIETY

FROM SCIENCE TO INDUSTRY

Through knowledge and technology transfer, ETH Zurich makes a key contribution to Switzerland's development. Interaction with industry and business is firmly embedded in the university's strategy.

In addition to its core tasks of training specialists and conducting research, ETH Zurich makes a significant contribution to the innovation ecosystem of the greater Zurich area and to the economic success of Switzerland and society in general.

The university's primary aim is to **transfer knowledge and technologies to the marketplace** and convert them into new products, thereby creating new jobs in Switzerland.

To ensure the transfer of knowledge and technology, ETH has established various platforms and partnerships, which it is continuously developing. To help put research ideas into practice, it supports the spin-off of young companies, among other things through the **technology transfer office, ETH transfer**.

The number of **spin-offs** is rising steadily, and 30 new spin-offs were founded at ETH in 2019 (see page 34). Investor funds raised by ETH spin-offs also reached a new all-time high. The bulk of the venture capital totalling more than 640 million Swiss francs went to the company GetYourGuide. It is the university's first spin off to achieve a market valuation of over 1 billion US dollars, having raised almost 500 million dollars during a financing round in May (see page 10). The spin-off Dimpora, which is developing a biodegradable, mineral-based coating for outdoor clothing, also attracted international attention. In Stockholm, the company won second prize in the Global Change Award, worth 250,000 euros, for its "Sane Membrane".

To encourage creativity and inventiveness within the university, ETH also presents the annual **Spark Award** for scientific ideas.

In 2019, the prize for most promising invention went to Professor Raffaele Mezzenga's laboratory for developing a new type of filter that removes harmful fluoride from drinking water.

To mark Alfred Escher's 200th birthday in 2019, ETH Zurich inaugurated the **Alfred Escher Prize** for young innovators between the ages of 17 and 25.

ETH transfer achieved yet another success by winning the *Global University Venturing* (GUV) Award for Tech Transfer Unit of the Year.

In 2019 it became the first institution outside the USA or UK to receive this prize (see page 34). With its **Pioneer Fellowships**, ETH Zurich helps junior researchers to develop new products and services. The scholarships contribute significantly to the conversion of innovative research ideas into products or services. Since 2010, a total of 97 scholarships have been awarded, and 60 spin-offs have emerged from them to date. In the first half of 2019, ETH Zurich awarded four Pioneer Fellowships. Ten Pioneer Fellows are currently in the research programme. They benefit from the support of the **Innovation & Entrepreneurship Lab** (ieLab).

Platforms allowing regular interaction between science and industry are very important. **Industry Day** (see page 34), which has been a regular fixture since 2013, together with company visits and workshops, provide for such interaction. ETH is also active in various national innovation networks, including the **Swiss Technology Transfer Association (swiTT) and Innosuisse**.

In 2019, contacts between the university and industry resulted in projects like the Mixed Reality & Artificial Intelligence Laboratory, which was inaugurated by Microsoft in October and will work closely with ETH Zurich.

ETH Zurich's Mobility Initiative acquired another partner, namely Siemens Mobility Ltd. ETH Zurich also leads the ESA Business Incubation Centre Switzerland (ESA BIC CH), which supports high-tech start-ups related to space travel.

ESA BIC CH has already supported over 30 start-ups from all over Switzerland since it was founded in late 2016.

In the greater Zurich area, ETH is involved in the new **Switzerland Innovation Park Zurich**, which is being developed at Dübendorf Airfield. Here, multidisciplinary research teams will test new forms of cooperation with industry, with ETH contributing mainly in the areas of robotics and mobility. In Hangar 3, the Swissloop team that developed transport pods for the Hyperloop Pod Competition and various robotics research projects have already carried out tests. ETH plans to take over another hangar.

The large number of awards won by ETH scientists year after year shows that the university offers the right environment for delivering academic excellence. In 2019 ETH received a series of prestigious prizes, including the Marcel Benoist Swiss Science Prize and the Körber Prize, and also awarded prizes itself, such as the Rössler Prize.

HONOURS AND AWARDS

RÖSSLER PRIZE FOR BRIGHT NANOPARTICLES

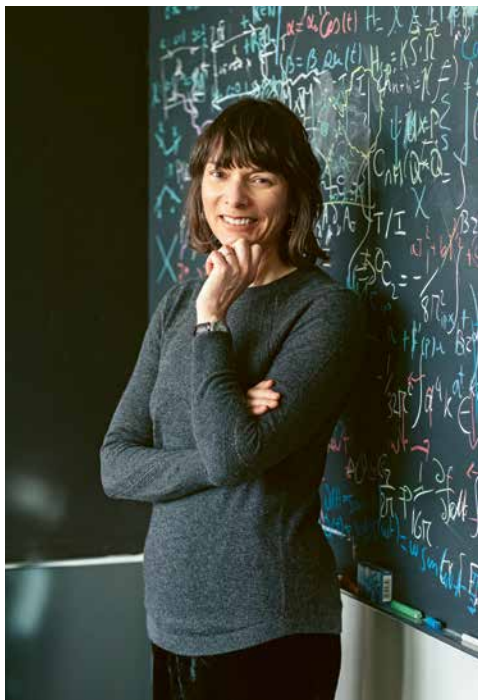
Maksym Kovalenko was awarded the Rössler Prize for his research into quantum dots that glow as nanoparticles in luminous colours. One potential application is the manufacture of displays with brighter and better colour resolution that are also less expensive and more energy efficient than current models.



OUTSTANDING ETH SCIENTISTS

In 2019 many ETH scientists again won prizes for their excellent performance. Here we offer five portraits of award-winning ETH researchers.

By Astrid Tomczak



MARCEL BENOIST
SWISS SCIENCE PRIZE

BASIC RESEARCH FOR THE DIGITAL WORLD

By now, **Nicola Spaldin** should really have got used to winning awards. But far from it: "I'm on edge every time and worried I might say something stupid," says the 50-year-old professor. Receiving the award often known as the "Swiss Nobel Prize" was also

an "unnerving experience," she confesses. Despite this, she was delighted to win the award. "The fact that the prize is presented by a federal councillor shows the importance that Switzerland places on materials science," says the scientist.

"None of the UN's Sustainable Development Goals can be achieved without basic research in materials science and engineering." Since 1920 the Marcel Benoist Foundation has awarded a prize in recognition of ground-breaking research with potential benefits for human life.

In 2019 the British scientist was honoured for her research into multiferroics. These materials respond to both magnetic and electric fields, a combination that does not generally occur simultaneously. This makes multiferroics promising materials that could, for example, replace silicon in future computer

chips, or be used in ultrafast computers, miniaturised data storage technologies or precision measurement devices in medicine.

Spaldin has been Professor of Materials Theory at ETH Zurich since 2011. She has already received numerous awards, including the Körber European Science Prize in 2015 and the L'Oréal-UNESCO For Women in Science award in 2017.

Her path to becoming a top scientist was not pre-ordained, however: "I did not grow up in an academic family," she recalls. She played clarinet as a child and thought about becoming a professional musician. Today her old piano sits next to her office on the Hönggerberg campus, though it's in poor condition. "One day perhaps I'll have a new action fitted in the old case," she says. But research will always be her number one passion.



GLOBAL 3RS AWARD/EUROPE 2019

MICROCHIPS SUPPLANT ANIMAL TESTING

Pregnant women need to be careful with pharmaceuticals. A medicine with no apparent negative effects on the parent could be harmful for the unborn child. For this reason, new

drugs are tested on pregnant rats and rabbits before being approved. **Julia Boos**, a doctoral student in the Department of Biosystems Science and Engineering at ETH Zurich in Basel, has developed an in-vitro process that can test new drugs for adverse effects on embryos without the need to use animals.

The junior researcher develops liver and embryonic cells in immediate proximity using the body-on-a-chip approach. "This allows us to test whether active substances are transformed into toxic substances through metabolism in the liver," Boos explains. Microchannels connect different areas of the chip containing the different types of cells. This ensures a constant liquid exchange and simulates a pregnant woman's circulatory system.

The new test cannot entirely replace animal trials. "But the new method will allow us to preselect

the most promising drug candidates for subsequent testing," Boos explains. This is attractive both ethically and economically, as animal trials cost a lot of time and money.

Julia Boos's research earned her the Global 3Rs Award for Europe in 2019. The Association for Assessment and Accreditation of Laboratory Animal Care International and the International Consortium for Innovation and Quality in Pharmaceutical Development award this prize to recognise efforts to promote the humane and ethical treatment of laboratory animals.

"The prize is a great honour and shows we are moving in the right direction," Julia Boos says. She plans to use the 5,000-dollar prize to continue her research. Her next step is to include placenta in the tests as well, as it also could play an important role in the metabolism of active substances.

LATSIS PRIZE

COOL ANALYST OF HEATED ISSUES

Alongside climate change, the other big topic dominating the political agenda is migration. It's an issue that stirs up strong emotions – which is precisely why it requires cool and objective analysis. This is provided by ETH political scientist **Dominik Hangartner**. His data originates from empirical research which often involves collaborations with government ministries, international organisations and NGOs. In 2019 the junior researcher was awarded the National Latsis Prize by the Swiss National Science Foundation for his research on migration.

For example, Hangartner researches the integration of refugees into local job markets, asylum processes and the naturalisation of immigrants. "Our knowledge should serve as the basis for innovative solutions in asylum and integration



policy in order to improve the situation for as many people as possible," he explains. The "allocation algorithm" he developed with colleagues from Stanford, for example, shows how research can support migration policy: the computer programme filters the individual attributes and skills of the refugees to match the skills that are particularly in demand in local job markets.

Hangartner's team is currently researching in countries including Greece. They have already identified the immediate effects of mass migration on Greece's northern Aegean islands: a sharp increase in hostility

towards migrants in the local population and broad support for a more restrictive asylum policy. Now the researchers also want to study the long-term consequences. They will use the prize money from the Latsis Foundation for this project. "We have effectively come full circle," says Hangartner, as the benefactors who set up the foundation come from Greece. The National Latsis Prize is one of Switzerland's most prestigious science prizes and is awarded to scientists up to the age of 40.

EU MIES AWARD

PEOPLE-FRIENDLY ARCHITECTURE

The commission: three crumbling blocks north of Bordeaux city centre, ripe for demolition, typical of the 1960s and part of a housing estate with a total of 4,000 apartments.

Anne Lacaton and Jean-Philippe Vassal are to upgrade 530 apartments and create more living space for residents. The parameters: around 14 days to work on each unit, while tenants stay in their apartments. The solution: new conservatories and balconies to make the apartments brighter and roomier. In addition, the bathrooms will be rewired and new lifts installed in the stairwell.

For Lacaton, housing is a basic human right. The living space of every person therefore needs to be extended and improved, says the

architect and ETH professor.

In Bordeaux, the aim was to work with what was already there and create a lighter, airier and more open space. When teaching students, Lacaton stresses how important it is in architecture to be mindful of the existing environment.

The renovation project was completed between 2014 and 2017, and in 2019 won the European Union Prize for Contemporary

Architecture – Mies van der Rohe Award. Commemorating the renowned architect Ludwig Mies van der Rohe, this is Europe's top architectural award and is worth 60,000 euros. The prize money will be used to finance the publication of a book on the project.



KÖRBER PRIZE

TEACHING COMPUTERS TO THINK

Self-driving cars, internet search engines, online translators: none of these would be viable without artificial intelligence (AI) and machine learning. But these daily helpers still have humans behind them, researching how to make the best

use of machines. One of them is the German physicist, mathematician and computer scientist **Bernhard Schölkopf**.

The 51-year-old Director at the Max Planck Institute for Intelligent Systems and Affiliated Professor at ETH is one of the ten most influential computer scientists in the world, according to the research journal *Science*. In 2019 he received the Körber European Science Prize. Endowed with 1 million euros, the Körber Prize is one of the highest accolades in the sciences and honours visionary approaches to research with strong potential for practical application.

Schölkopf and his team develop algorithms that enable computer programmes to react flexibly to situations. This has produced methods for machine learning that can be used in biology, medicine, economics and the social sciences. Schölkopf achieved global renown with specialised machine learning processes, known as support vector machines (SVM). These are sophisticated

algorithms which enable computers to carry out highly complex AI calculations quickly and accurately.

At the moment, Schölkopf's team is researching algorithms that can also infer causal relationships from data. Schölkopf uses an example to illustrate this: a human can identify a cow even if it is standing on a beach rather than on a meadow. A computer, on the other hand, could have difficulty because it may only have been fed data showing a cow on a meadow. "When developing AI we therefore need to incorporate the causality as well," he explains. Ultimately the big challenge is to develop machines that not only learn, but are also able to think. Could he possibly be creating a situation where robots could become superior to humans? "There are risks and opportunities with every technology," the scientist says. "Looking back at the history of civilisation, however, it seems that the opportunities have outweighed the risks, and I expect exactly the same to happen with artificial intelligence."

SPECIAL PRIZES FOR ETH SCIENTISTS

DORON PRIZE

Professor Thomas Schulthess, Professor of Computational Physics in the Department of Physics and Director of the Swiss National Supercomputing Centre (CSCS), has been honoured for his outstanding achievements in the field of high-performance computing. As one of the most renowned scientists in the field of supercomputing, he has been particularly active in encouraging close collaboration between the various scientific disciplines.

LATSIS PRIZE (OF ETH ZURICH)

Professor Randall Platt, Assistant Professor (Tenure Track) in the Department of Biosystems Science and Engineering, has been honoured for his exceptional work in the field of genome engineering. Still early in his career, he has already developed many methods and technologies that are used by life science researchers in laboratories around the world, such as the Cas9 mouse, an animal model based on the CRISPR-Cas system which allows scientists to edit genes in individual organs or tissues in order to study their function or role in disease.

PRIX ZONTA

Professor Simone Schürle-Finke, Assistant Professor (Tenure Track) of Reactive Biomedical Systems at ETH Zurich, together with Andrea Ablasser, an immunologist from EPFL, has been awarded the Prix Zonta 2019. Simone Schürle-Finke and her team develop tiny machines on the micro- or nanometre scale for medical applications in the human body, such as the local delivery of active substances.

SCI-TECH AWARD

Researchers from ETH Zurich and Disney Research had the honour of receiving a Sci-Tech Oscar in Hollywood. **Professor Markus Gross, Professor Bernd Bickel, Dr Thabo Beeler and Dr Derek Bradley** were honoured for their capture system, Medusa, which uses scanners to record facial movements and then reconstructs them into animated figures. The system has now become the digital standard in the film industry.

GORDON BELL PRIZE

Two ETH research groups consisting of **Professor Torsten Hoefler, Professor Mathieu Luisier, Alexandros Nikolaos Ziogas, Dr Tal Ben-Nun, Dr Guillermo Indalecio Fernández and Timo Schneider** received the ACM Gordon Bell Prize. They won the prize for developing a method that can simulate nanoelectronics devices and their properties realistically, quickly and efficiently. The purpose of the simulation is to make current nano-scale transistors smaller, more efficient and more powerful.



HONORARY DOCTORATES

By awarding honorary doctorates, ETH Zurich honours individuals for their outstanding scientific work and recognises their important contribution to science, education and practical applications, or to the synthesis of research and practical work.

ETH awarded the following honorary doctorate in 2019:

Professor Evelyn Hu

For her outstanding scientific research, especially her vital contributions to semiconductor physics and the development of technological methods that provide the basis for numerous optoelectronic components.

▲ Professor Evelyn Hu, recipient of an honorary doctorate from ETH Zurich (2nd from left), with ETH Rector Sarah Springman, ETH President Joël Mesot and the Head of the Department of Physics Jérôme Faist (left to right) at ETH Day 2019.

ETH continues to grow – both in terms of physical space and staff numbers. Strategic portfolio management plays a key role in this expansion. On the technology front, demands on infrastructure are becoming increasingly specialised. With over 12,000 employees from Switzerland and abroad, the university is one of the biggest employers in the greater Zurich area. It offers stimulating and attractive jobs in teaching, research and support roles. Outstanding performance at every level keeps ETH at the top of world rankings, so it expects a lot from its employees. As a responsible employer, the university offers attractive terms of employment and good working conditions, which it continuously seeks to improve through various measures.

HUMAN RESOURCES AND INFRASTRUCTURE

OUTSTANDING LEADERSHIP

Gabriela Hug was presented with the ALEA Award in 2019. This award honours leaders who encourage advanced and innovative working conditions and who promote a good balance between work, family and other commitments. Gabriela Hug's staff describe her main qualities as inspirational, committed, supportive and very considerate.





SUPPORTING A CULTURE OF COOPERATION

ETH is introducing a series of new measures in the areas of leadership and personnel development. Specific topics include cooperation, career planning and respect.

by Michael Zollinger

▲ The Leadership in Perspective event series organised by the Office of Equal Opportunities combines two key elements for personnel development: promotion of women and leadership.

Leadership is set to play a more important role at ETH Zurich. In future the university will provide more leadership training to cater for the needs of professors and supervisors. "At the new Orientation Day, for example, new professors will be given a full briefing on leadership. We have also launched the Leadership 4to7 programme for assistant professors, which covers topics such as recruitment, supervision and unconscious bias," explains Lukas Vonesch, Head of Human Resources. The coaching opportunities for all ETH supervisors are also being extended. Another stated goal is to improve the self-governance of academics and their departments. Keywords here include career and succession planning. The idea is to actively encourage interested and suitable candidates to take on roles such as department head, vice rector or senior manager.

Supervision and high performance expectations

"Careers in science are very different from those in industry. In the case of postdocs and senior assistants, for example, their term of employment is limited from the outset. That makes the supervisory situation very challenging. Our task is to make people fit to leave their post, in the hope that they will eventually return to

ETH," explains Ulrich Weidmann, Vice President for Human Resources and Infrastructure. At the same time, it is important to respond to cultural change, he adds.

In recent years the university has become far more international. There is a different understanding of hierarchies, as well as the question of the relationship between the individual and the institution. Expectations on supervisors for advice and support have also risen. "Reconciling this with the huge pressure to perform is one of our most pressing challenges," stresses Vice President Weidmann.

"Respect" – a new advice and reconciliation service

Not least in light of recent events, ETH has taken action to deal with unacceptable behaviour. The existing ombudspersons have been augmented with an external ombudsperson. A new internal advice and reconciliation service, known as Respect, has been set up, and an external independent service will be added soon. "These cases are usually highly complex. They can involve discrimination, bullying or sexual harassment, and in any combination," says Lukas Vonesch. While some people want to speak to someone who is familiar with the university environment, others prefer to seek external advice. In future a dedicated group will structure the procedures and deal with case management.

Greater support for women

Only 16 percent of professorial posts at ETH are held by women. But the trend over the last few years has at least been positive, with 30 percent of new appointments having gone to women. ETH has already taken major steps to address this issue, such as ensuring the appropriate composition of committees making appointments.

As a public employer, ETH guarantees equal pay, supports part-time working and childcare services and much more besides. Now it is stepping up efforts to promote women. One concrete measure is the newly created pool of ten additional professorships. This pool will be activated whenever there is an opportunity on top of the existing recruitment schedule to attract leading female researchers as professors.

The entire process needs to start early. The proportion of female students is roughly 33 percent – a figure that varies enormously between disciplines. In the fields of computer science, electrical engineering and mechanical engineering it is stuck at around 10 to 15 percent, compared with over 60 percent in subjects such as health sciences and environmental sciences. Rigid academic career paths are an obstacle, however. After the doctorate, a postdoc vacancy must be immediately available at the right location, followed by an assistant professorship, and so on. "Taking a break to start a family is very challenging. A supportive partner with a modern understanding of parental roles can make a huge difference, says Weidmann.

GROUND-BREAKING CEREMONY

HÖNGGERBERG CAMPUS EXTENSION

In July ETH Zurich and the team of architects, building planners and construction managers involved in the project attended the ground-breaking ceremony for the HIF renovation and extension project on the Hönggerberg campus.

The renovation and extension of the home of the Department of Civil, Environmental and Geomatic Engineering will afford the department and its institutes more development opportunities.

It will simplify collaboration between different professorships,

▼ Attendees at the ground-breaking ceremony for the new HIF building in front of "Menzi Muck", a semi-autonomous excavator.



provide modern laboratories and improve climatic conditions in the workplace. The new HIF building, which was designed by Zurich-based architect firm Stücheli Architekten AG, should be completed by the beginning of 2023.

The modernisation and extension of HIF are part of the Campus Hönggerberg 2040 Master Plan. This sets out how ETH would like to develop the Hönggerberg campus over the coming decades in order to accommodate the expected growth in the number of students and researchers, as well as providing the necessary space for new trends and infrastructure in research and innovative teaching methods.

CONTINUING EDUCATION

CLEAR STRATEGY FOR THE FUTURE

The Executive Board domain Human Resources and Infrastructure has a clear vision: to provide the right conditions for excellence in research, teaching and knowledge transfer. To flesh out the goals of this vision and derive appropriate action plans from it, the various administrative departments in this domain draw up strategies which are updated every four years. On this basis, functional strategies are formulated for strategically relevant themes. The guideline used here is the academic planning set out in ETH Zurich's Strategy and Development Plan 2017–2020. This is based in turn on the Strategic Planning of the ETH Board, which itself must comply with the Federal Council Dispatch – the strategy of the State Secretariat for Education, Research and Innovation.

In 2019 ETH Zurich worked on developing the strategy for the next period, as outlined in the latest document: Strategy and Development Plan 2021–2024.

Strategies for Real Estate Management and ETH Library

Four administrative departments in Human Resources and Infrastructure have a strategy for the period 2017–2020. The Executive Board has

already approved strategies for Real Estate Management and ETH Library for the next four-year period. The other departments will draw up their strategies with close reference to the overarching planning for 2020, for eventual approval by the Executive Board.

The Real Estate Management Strategy 2020–2024 defines ten strategic principles which are divided into action areas and concrete measures. These include promoting interdisciplinary exchange of students and staff across departments, through ETH Zurich's site allocation and the expansion of infrastructure in accordance with the main points of the Strategy and Development Plan. In addition, new or refurbished buildings must result in premises that are fit for purpose, while at the same time ensuring that the existing structure is properly preserved. The allocation of space should respect uniform criteria and ensure a consistently high level of use. Finally, Real Estate Management will prioritise the three pillars of sustainability in order to ensure prudent management of natural resources and a reduction of environmental impacts.

Digitalisation is the key issue for ETH Library. Its Strategy 2020–2024 sets out the conditions for maintaining its standing as an independent and reliable entity and ensuring that its users will continue to have access to a comprehensive pool of relevant, stable and dependable knowledge.

Three basic building blocks form the basis of the five strategic action areas that will drive the necessary transformation and development process of ETH Library in the coming years: consistent focus on the customer, holistic support of customers in acquiring, producing and distributing knowledge and the integral platform Connector. Connector is both a physical platform and a conceptual model that provides one-stop modular and individual access to the products and services offered by ETH Library.



▲ This is how the new Polyterrace could look: the ETH campus will be revamped as part of the Real Estate Management Strategy 2020–2024.

STAFF BY FUNCTION

ETH Zurich (consolidated)

Full-time equivalents (FTEs) at the end of 2019 (reporting date) or annual average	FTEs annual average						FTEs on reporting date at y/e
	2018 Total	2019 Total	Women	Inter- national staff	Increase		
					Absolute	in %	
Total staff ¹	9,527.9	9,845.0	33.7 %	57.0 %	317.1	3.3 %	9,979.5
of which permanent members of staff	3,019.0	3,097.3	36.5 %	30.2 %	78.3	2.6 %	3,127.1
Professors ²	495.7	502.3	16.3 %	67.1 %	6.5	1.3 %	506.7
Full professors	404.4	403.9	14.3 %	64.3 %	−0.5	−0.1 %	404.5
Assistant professors	91.4	98.4	24.7 %	78.7 %	7.1	7.7 %	102.3
Scientific staff	6,093.5	6,281.9	31.1 %	72.0 %	188.4	3.1 %	6,355.5
Permanent scientific staff	259.0	261.7	14.8 %	47.4 %	2.7	1.0 %	268.2
Temporary scientific staff	5,416.1	5,565.4	31.5 %	76.3 %	149.2	2.8 %	5,665.8
Senior assistants, scientific staff (temporary)	680.4	710.1	26.8 %	76.1 %	29.7	4.4 %	705.7
Postdoctoral researchers, scientific assistants II	1,128.5	1,182.0	31.8 %	90.3 %	53.5	4.7 %	1,210.3
Scientific assistants I	3,607.3	3,673.3	32.3 %	71.8 %	66.1	1.8 %	3,749.8
Teaching/research assistants	418.4	454.9	34.9 %	34.5 %	36.5	8.7 %	421.5
Technical and administrative staff	2,766.9	2,891.6	42.7 %	25.6 %	124.8	4.5 %	2,948.3
of which permanent members of staff	2,358.0	2,434.1	42.4 %	22.7 %	76.1	3.2 %	2,456.5
Technical and IT staff	1,484.5	1,556.1	19.6 %	31.2 %	71.7	4.8 %	1,598.0
Administrative staff	1,282.4	1,335.5	69.6 %	19.0 %	53.1	4.1 %	1,350.3
Apprentices	171.8	169.2	30.0 %	7.7 %	−2.6	−1.5 %	169.0

¹ Including 138.1 FTEs at ETH Singapore SEC Ltd. on average in 2019, on the reporting date 127.8 FTEs; all scientific staff in both 2018 and 2019 were fully allocated to the different categories of temporary scientific staff. Technical and administrative staff at ETH Singapore SEC Ltd. were also allocated to temporary staff.

² Headcount 2019: 541 (incl. professors with appointments at other institutions).

STAFF BY AREA

Total staff

FTEs annual average

FTEs on
reporting
date at y/e

Full-time equivalents (FTEs)
at the end of 2019 (reporting date) or annual average ¹

	2018 Total	2019 Total	Women	Inter- national	Increase		2019 Total
					Absolute	in %	
ETH Zurich (consolidated)	9,527.9	9,845.0	33.7 %	57.0 %	317.1	3.3 %	9,979.5
Departmental total	7,699.4	7,886.2	32.7 %	63.6 %	186.8	2.4 %	7,988.6
Architecture and Civil Engineering	980.4	994.3	34.8 %	59.3 %	13.9	1.4 %	1,017.1
Architecture	409.8	404.9	40.2 %	57.4 %	-4.8	-1.2 %	418.7
Civil, Environmental and Geomatic Engineering	570.6	589.3	31.1 %	60.6 %	18.7	3.3 %	598.4
Engineering Sciences	2,282.7	2,346.5	21.9 %	68.3 %	63.8	2.8 %	2,397.2
Mechanical and Process Engineering	711.3	701.0	19.3 %	62.1 %	-10.3	-1.4 %	722.8
Information Technology and Electrical Engineering	584.1	598.8	19.8 %	67.0 %	14.7	2.5 %	617.5
Computer Science	446.0	488.0	19.2 %	70.7 %	42.0	9.4 %	496.7
Materials	235.4	244.3	25.7 %	67.1 %	8.9	3.8 %	249.7
Biosystems Science and Engineering	305.9	314.4	32.8 %	82.3 %	8.5	2.8 %	310.5
Natural Sciences and Mathematics	2,323.2	2,346.9	32.0 %	63.0 %	23.6	1.0 %	2,333.1
Mathematics	287.8	296.8	24.2 %	62.1 %	9.0	3.1 %	259.6
Physics	629.2	641.2	20.3 %	58.2 %	12.0	1.9 %	655.3
Chemistry and Applied Biosciences	802.5	807.5	32.4 %	64.6 %	5.0	0.6 %	812.1
Biology	603.7	601.3	47.6 %	66.2 %	-2.5	-0.4 %	606.1
System-oriented Natural Sciences	1,486.9	1,556.9	45.4 %	61.0 %	70.0	4.7 %	1,579.7
Earth Sciences	323.9	330.6	34.6 %	67.9 %	6.6	2.1 %	340.5
Environmental Systems Science	646.4	672.4	45.8 %	58.6 %	26.0	4.0 %	679.1
Health Sciences and Technology	516.6	553.9	51.4 %	59.6 %	37.3	7.2 %	560.0
Management and Social Sciences	626.2	641.7	40.7 %	61.2 %	15.5	2.5 %	661.6
Management, Technology, and Economics	338.2	343.0	41.5 %	64.7 %	4.7	1.4 %	345.7
Humanities, Social and Political Sciences	288.0	298.7	39.8 %	57.1 %	10.8	3.7 %	315.9
Teaching and research facilities outside the academic departments, others ²	509.4	571.1	34.4 %	62.4 %	61.7	12.1 %	581.6
Executive Board, staff units and administrative departments	1,319.1	1,387.7	39.2 %	17.7 %	68.6	5.2 %	1,409.3
Executive Board and staff units	132.3	145.7	60.8 %	24.9 %	13.4	10.1 %	150.7
Administrative departments	1,186.8	1,242.0	36.7 %	16.8 %	55.2	4.7 %	1,258.6
Corporate Communications	27.6	27.4	58.6 %	22.0 %	-0.2	-0.6 %	29.2
Academic Services	60.5	63.9	64.7 %	14.9 %	3.3	5.5 %	66.8
Educational Development and Technology	31.9	35.3	39.1 %	27.6 %	3.5	10.9 %	36.1
Student Services	15.6	15.8	81.0 %	3.8 %	0.2	1.4 %	15.8
Controlling	20.9	23.8	50.5 %	10.5 %	2.9	13.7 %	24.1
Financial Services	18.0	19.0	27.4 %	11.6 %	1.0	5.8 %	18.8
Accounting	41.4	44.5	46.7 %	16.8 %	3.1	7.6 %	45.3
Facility Management	189.4	193.2	18.3 %	19.9 %	3.8	2.0 %	193.5
ETH Library	218.1	225.4	60.2 %	16.9 %	7.3	3.4 %	224.9
Real Estate Management	72.8	75.8	30.7 %	14.8 %	3.0	4.2 %	76.1
IT Services	278.7	296.3	11.3 %	19.2 %	17.6	6.3 %	306.1
Human Resources	71.7	73.2	69.7 %	10.2 %	1.5	2.1 %	71.8
Services	98.1	103.9	38.6 %	10.0 %	5.9	6.0 %	104.8
Safety, Security, Health and Environment	41.2	42.3	30.3 %	16.6 %	1.1	2.7 %	43.5

¹ The average number of employees at the end of both the reporting year and the previous year is based on the current organisational structure of ETH Zurich as at 31 December 2019. Since 2017, both the headcount and the calculation are reported on a consolidated basis; the figures shown in the table therefore include the staff at ETH Singapore SEC Ltd.

² "Teaching and research facilities outside the academic departments, others" refers to the Institute of Science, Technology, and Policy (ISTP), Collegium Helveticum, Congressi Stefano Franscini, ETH Institute for Theoretical Studies

(ITS), Wyss Translational Center Zurich (Wyss Zurich), Functional Genomic Center Zurich, NEXUS Personalized Health Technologies, FIRST Lab, B&R Nanotechnology Center, ScopeM, ETH Phenomics Center, Swiss Seismological Service (SED), CSCS, AgroVet-Strickhof, Swiss Data Science Center (SDSC) and other central projects. The headcount of the fully consolidated unit ETH Singapore SEC Ltd. is also included (127.8 FTEs as at 31 December 2019 and 138.1 FTEs on average in 2019).

NEW PROFESSORSHIPS

New appointments in 2019

FULL PROFESSORS



Professor Afonso Bandeira,
Mathematics, D-MATH, formerly Associate
Professor at New York University, USA



Professor Alexander Barnes,
Solid State NMR Spectroscopy, D-CHAB, formerly
Associate Professor at Washington University,
St. Louis, USA



Professor Kirsten Bomblies,
Molecular Plant Sciences, D-BIOL, formerly
project leader at the John Innes Centre
and Honorary Professor at the University
of East Anglia, Norwich, United Kingdom



Professor Volkmar Falk,
Translational Cardiovascular Technologies,
D-HEST, also Professor at Humboldt-Universität,
Director of the Department of Cardiovascular
Surgery at the Charité hospital, and Medical
Director of the German Heart Institute, all in
Berlin, Germany



Professor Louise Harra,
Solar Astrophysics, D-PHYS, formerly Professor
at University College London, United Kingdom



Professor Kenneth Paterson,
Computer Science, D-INFK, formerly
Full Professor at Royal Holloway, University
of London, United Kingdom



Professor Freek Persyn,
Architecture and Urban Transformation, D-ARCH,
formerly Visiting Professor at Hasselt University
and co-owner and founding partner of the
architecture firm 51N4E, Brussels, Belgium



Professor Bernhard Schölkopf,
Empirical Inference, D-INFK, also Director at
the Max Planck Institute for Intelligent Systems,
Tübingen and Stuttgart, Germany



Professor Andreas Taras,
Steel and Composite Structures, D-BAUG,
formerly Professor at the University of the
Federal Armed Forces, Munich, Germany



Professor Caroline Uhler,
Machine Learning, Statistics and Genomics,
D-BSSE, formerly Associate Professor at
the Massachusetts Institute of Technology,
Cambridge, USA

PROMOTIONS



Professor Niko Beerenwinkel,
Computational Biology, D-BSSE, formerly
Associate Professor at ETH Zurich, Switzerland



Professor Roger Gassert,
Rehabilitation Engineering, D-HEST, formerly
Associate Professor at ETH Zurich, Switzerland



Professor Gabriela Hug,
Electric Power Systems, D-ITET, formerly
Associate Professor at ETH Zurich, Switzerland



Professor Christoph Müller,
Energy Science and Engineering, D-MAVT,
formerly Associate Professor at ETH Zurich,
Switzerland



Professor Roger Schibli,
Radiopharmacy, D-CHAB, formerly Associate
Professor at ETH Zurich and laboratory head
at PSI, Switzerland



Professor Jeroen van Bokhoven,
Heterogeneous Catalysis, D-CHAB, formerly
Associate Professor at ETH Zurich and laboratory
head at PSI, Switzerland



Professor Vanessa Wood,
Materials and Device Engineering, D-ITET,
formerly Associate Professor at ETH Zurich,
Switzerland



Professor Bryan Adey,
Infrastructure Management, D-BAUG, formerly
Associate Professor at ETH Zurich, Switzerland

ASSOCIATE PROFESSORS



Professor Florian Dörfler,
Complex Systems Control, D-ITET, formerly
Assistant Professor (tenure track) at ETH Zurich,
Switzerland



Professor Gonzalo Guillén Gosálbez,
Chemical Systems Engineering, D-CHAB,
formerly Reader at Imperial College London,
United Kingdom



Professor Anne Holtrop,
Architecture and Design, D-ARCH, formerly
Visiting Professor at the Academy of Architecture,
Università della Svizzera Italiana, Mendrisio,
Switzerland, and owner of the architecture firm
Studio Anne Holtrop, Amsterdam, Netherlands



Professor Giacomo Indiveri,
Neuromorphic Cognitive Systems, D-ITET, also
Associate Professor at the University of Zurich,
Switzerland



Professor Lucio Isa,
Soft Materials and Interfaces, D-MATL, formerly
Assistant Professor at ETH Zurich, Switzerland



Professor Martin Pilhofer,
Cryo-Electron Microscopy, D-BIOL, formerly
Assistant Professor at ETH Zurich, Switzerland



Professor Sascha Quanz,
Exoplanets and Habitability, D-PHYS, formerly
senior scientist at ETH Zurich, Switzerland



Professor Alexandre Theriot,
Architecture and Design, D-ARCH, formerly
founding partner and architect at BRUTHER,
Paris, France and Lausanne, Switzerland



Professor Barbara Treutlein,
Quantitative Developmental Biology, D-BSSE,
formerly Assistant Professor (tenure track) at
the Technical University of Munich and research
group leader at the Max Planck Institute for
Evolutionary Anthropology in Leipzig, Germany

ASSISTANT PROFESSORS



Professor Jake Alexander,
Plant Ecology, D-USYS, formerly Assistant
Professor at the University of Lausanne,
Switzerland



Professor Athina Anastasaki,
Polymeric Materials, D-MATL, formerly
research fellow at the University of California,
Santa Barbara, USA



Professor Valentina Boeva,
Biomedical Informatics, D-INFK, formerly
group leader at Université de Paris, France



Professor Yiwen Chu,
Hybrid Quantum Systems, D-PHYS, formerly
postdoctoral researcher at Yale University,
New Haven, USA



Professor Sebastian Dötterl,
Soil Resources, D-USYS, formerly group leader
at the University of Augsburg, Germany



Professor Klaus Eyer,
Functional Immune Repertoire Analysis,
D-CHAB, formerly group leader at ESPCI and
research associate at the Institut Pasteur,
both in Paris, France



Professor Peter Feller,
Mathematics, D-MATH, formerly postdoctoral
researcher at ETH Zurich, Switzerland



Professor Rachael Garrett,
Environmental Policy, D-GESS, formerly Assistant
Professor (tenure track) at Boston University, USA



Professor Lavinia Heisenberg,
Theoretical Cosmology, D-PHYS, formerly post-
doctoral researcher at ETH Zurich, Switzerland



Professor Inge Herrmann,
Nanoparticle Systems Engineering, D-MAVT,
formerly group leader at Empa, Switzerland



Professor Christian Holz,
Computer Science, D-INFK, formerly researcher
in private industry



Professor Madhav Jagannathan,
Cellular Dynamics, D-BIOL, formerly postdoctoral
researcher at the University of Michigan, USA



Professor David Kammer,
Computational Mechanics of Building Materials,
D-BAUG, formerly Assistant Professor at Cornell
University, Ithaca, USA



Professor David Kaufmann,
Spatial Development and Urban Policy, D-BAUG,
formerly postdoctoral researcher at the
University of Bern, Switzerland



Professor Rasmus Kyng,
Theoretical Computer Science, D-INFK, formerly
postdoctoral researcher at Harvard University,
Cambridge, USA



Professor Maria Lukatskaya,
Electrochemical Energy Systems, D-MAVT,
formerly postdoctoral researcher at the
SLAC National Accelerator Laboratory,
Stanford University, Menlo Park, USA



Professor Cara Magnabosco,
Geobiology, D-ERDW, formerly postdoctoral
researcher at the Simons Foundation's Flatiron
Institute, New York, USA



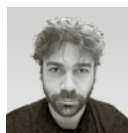
Professor Daniela Rupp,
Nanostructures and Ultrafast X-Ray Science,
D-PHYS, formerly research group leader at the
Max Born Institute, Berlin, Germany



Professor Benjamin Stocker,
Computational Ecosystem Science, D-USYS,
formerly research fellow at the Ecological and
Forestry Applications Research Centre (CREAF),
Barcelona, Spain



Professor Thomas Van Boeckel,
Health Geography and Policy, D-USYS,
formerly postdoctoral researcher at ETH Zurich,
Switzerland



Professor Michalis Vassiliou,
Seismic Design and Analysis, D-BAUG, formerly
senior assistant and lecturer at ETH Zurich,
Switzerland



Professor Julia Vogt,
Medical Data Science, D-INFK, formerly Assistant
Professor at the University of Basel, Switzerland



Professor Ferdinand von Meyenn,
Nutrition and Metabolic Epigenetics, D-HEST,
formerly group leader at King's College London,
United Kingdom



Professor Melanie Zeilinger,
Intelligent Control Systems, D-MAVT, formerly
Assistant Professor at ETH Zurich, Switzerland

ADJUNCT PROFESSORS

Professor Mikaela Iacobelli,
D-MATH, senior scientist at ETH Zurich,
Switzerland

Professor Susan Ivy Ochs,
D-ERDW, scientist and senior lecturer at
ETH Zurich, Switzerland

Professor André Prévôt,
D-USYS, deputy laboratory head at ETH Zurich
and group leader at PSI, Switzerland

Professor Carsten Schubert,
D-USYS, lecturer at ETH Zurich, Switzerland

Professor Jürg Schweizer,
D-BAUG, lecturer at ETH Zurich, Switzerland

Professor Ana Cannas da Silva,
D-MATH, senior scientist at ETH Zurich,
Switzerland

Professor Monika Maurhofer Bringolf,
D-USYS, senior scientist at ETH Zurich,
Switzerland

Professor Tomaso Zambelli,
D-ITET, senior lecturer at ETH Zurich, Switzerland



OVERVIEW OF HUMAN RESOURCES AND INFRASTRUCTURE

SERVING THE UNIVERSITY

Human Resources and Infrastructure provides integral and state-of-the-art infrastructures and services for teaching, research, knowledge transfer and dialogue with the public.

With its core expertise in sustainable sourcing, facilities management, refurbishment and maintenance, the Human Resources and Infrastructure domain works towards a common vision and mission: **promoting excellence in research, teaching and knowledge transfer through highly qualified and motivated staff, excellent infrastructure, proven technology and efficient services.**

The **Real Estate Management** department is responsible for developing the university's various sites. It looks after ETH Zurich's real estate portfolio and assures the availability, on behalf of the ETH Board and Executive Board, of the required facilities and building infrastructure in a timely and cost-effective manner (see page 45).

The approval in 2019 of the first section of the 2016 Partial Amendment of the Cantonal Structure Plan is an important step in realising the vision for the ETH Campus Höggerberg 2040 Master Plan, clearing the path for long-term capacity expansion. Once the Zurich City Executive Council approves the special building regulations in 2020, they will be debated in the Municipal Council of the City of Zurich. Especially in the critical planning phase, ETH is working closely with local neighbourhoods.

The focus has also been on preserving the value and functionality of premises, with the launch of several projects such as the modernisation and expansion of the HIF building (see page 45). In 2019 ETH also made good progress with the development plan for Zurich City University District (HGZZ), with the signing of a contract for the joint implementation of the first development axis up to 2030. The first concrete steps were also taken towards realising Campus Höggerberg 2040.

The **Facility Management** department, which looks after the utilities

and technical and infrastructural management for all buildings and facilities used by ETH Zurich, has just completed an important step towards ensuring a constant power supply for the Höggerberg campus, following the successful completion of the voltage conversion project.

The **Human Resources** department actively supports the career development of all ETH members. In 2019 it passed several measures to expand leadership courses, such as orientation days for new professors. A new internal advice and conciliation service has been set up, as well as an external, independent advice service. As a public employer, ETH guarantees equal pay, supports part-time working and provides childcare services (see page 44).

The **Safety, Security, Health and Environment** department focuses on safety in the workplace and classroom, implements environmental measures to reduce pollution and offers consulting, prevention and training. A specialist in occupational medicine now offers ETH members systematic support in the diagnosis and prevention of occupational injuries and illnesses. The Barrier-Free at ETH Zurich project has also been officially launched, together with the Mobility platform. The pioneering principle here is "designs for all", which aims for a general improvement in quality for everyone without introducing new restrictions.

IT Services provides services relating to information and communication technology and also runs the extensive infrastructure, information systems and applications required for this.

The computing centre strategy oversees the long-term development of centrally operated data centres and the associated technical and spatial requirements.

The Swiss National Supercomputing Centre (CSCS), which provides the computational power for national

researchers, is due to acquire a new computer system. This will replace the current flagship, Piz Daint, and will have significantly more computing power. CSCS, which currently runs at full capacity, is an important element in the infrastructure to support Swiss researchers, who need access to extremely powerful supercomputers. The Swiss Data Science Center also benefits from synergy effects with CSCS.

ETH Library is the largest public technical and scientific library in Switzerland and a national centre for information on the natural sciences and engineering sciences. To fulfil its mandate, it is also pushing ahead with the digitalisation of its collections and archives (see page 45). This involves comprehensive digital provision of information with a broad portfolio of customer-oriented services. The Swiss Library Services Platform (SLSP) and the related goal of setting up a national infrastructure for scientific libraries will allow the outsourcing of services of the NEBIS network previously based at ETH Library.

The **Services** department provides information and services to internal and external customers on the university campus. For example, it is developing the Workshop Platform so as to improve the transparency and availability of knowledge management across a broad range of machines and processes.

A man with a beard and glasses, wearing a blue polo shirt and dark pants, is sitting on a concrete ledge. A woman with curly hair and glasses, wearing a teal long-sleeved shirt and dark pants, is standing behind him, smiling. They are in a modern building with large concrete pillars and a glass railing in the background.

With an Executive Board chaired by the ETH President and a solid system of participation, ETH Zurich has a sound leadership structure that has played a key role in delivering successful outcomes for the university. As part of overall governance, the risk management system takes account of potential internal and external risks. Appropriate measures are in place to reduce risk exposure to an acceptable level and increase the risk awareness of ETH staff. ETH Zurich is not only one of the world's top-ranking universities in energy, environmental and sustainability research, but also integrates the principles of sustainability in all areas of campus development.

GOVERNANCE AND SUSTAINABILITY

**UNIQUE CHEMISTRY:
AROMATIC MOLECULES
AND PARENTHOOD**

Renana Gershoni-Poranne is both a researcher and mother. Apart from her daily work, the 35-year-old chemist, winner of a Branco Weiss Fellowship, champions the greater involvement of women in the natural sciences. And both she and her husband – also an ETH researcher – are role models for their two sons, showing them that women can successfully combine parenthood with a career in science.





MAKING THE UNIVERSITY FIT FOR THE FUTURE

ETH Zurich has responded to the rapidly changing environment by launching rETHink, a project setting out a roadmap for the university's future development. Measures include the creation of two new Executive Board domains: one for Knowledge Transfer and Corporate Relations, and one for Personnel Development and Leadership.

by Michael Zollinger

▲ The Executive Board holds regular town hall meetings to provide updates on the rETHink project and the university's development.

The university is facing a number of major challenges: greater international competition, growing expectations from society, and the dynamic pace of the institution's growth. Added to this is the ever-broadening diversity in cultural as well as scientific aspects.

With around 22,200 students and almost 550 professorships, ETH has grown to the point where it must adapt its organisation if it is to maintain its leading international reputation in research and teaching. The Executive Board has responded by initiating the rETHink project, whose goal is to optimise internal processes, services, structures and instruments. "In the long term we want to ensure that our key service providers – the professors along with their staff – are fully equipped to continue to carry out their mission well in future," says ETH President Joël Mesot.

The project is structured into six workstreams and encompasses all of the university's institutional levels: the professorships, the academic departments and the Executive Board, as well as the central administrative units and university boards. Culture

development will also receive particular attention as part of the project.

New Executive Board domains

The first step will be to expand the Executive Board. One of the two new Executive Board domains will be dedicated to Knowledge Transfer and Corporate Relations, which means that in future each of the university's three core tasks of teaching, research and knowledge transfer will be managed by its own vice president.

Strengthening the leadership skills and culture for all employees – ETH Zurich's most important resource – is another priority for Mesot. In future this role will therefore also be given to a dedicated Vice President for Leadership and Personnel Development. Their task will be to ensure optimal support for researchers, doctoral students and all other employees in their professional careers. This includes more effective and systematic support for women.

Key role in innovation

By creating the new domain Knowledge Transfer and Corporate Relations, ETH is better equipped to fulfil its role as a key player in Switzerland's innovation drive. "Our top priority is to benefit society as a whole," Mesot stresses.

As well as supporting ETH spin-offs, the new domain will focus on partnerships both with large corporations and SMEs. This will require a review of the allocation of tasks across all three levels: the professorships, academic departments and central administrative units. A key aim here is to demonstrate to policymakers and society as a whole that ETH is working specifically on topics that will benefit Swiss society in the long term. The President gives an example to illustrate this: "If our scientists had not conducted ground-breaking research into energy a century ago, our current researchers would not be able to contribute to Switzerland's energy future."

Discussion of ETH values

When it comes to culture development, the discussion inevitably focuses on values. Quality and trust are core values for the university. Mesot talks about the "culture of empowerment" which characterises ETH Zurich and needs to be strengthened. The same applies to individual responsibility. "No matter how long they are part of our ETH community, everyone should leave feeling enriched by their experience here," he says.

The new Executive Board domains will be established over the course of 2020 and two new vice presidents appointed. A broadly based participation process will ensure that feedback from professors, staff and participation committees is channelled into the development process.

▼ Departing ETH President
Lino Guzzella literally
"hands over the helm" to
Joël Mesot.



LOOKING TO THE FUTURE FROM A POSITION OF STRENGTH

"The management and administration of the university effectively support its core scientific mission."



Robert Perich,
Vice President
for Finance and
Controlling

As with every change at the helm of ETH, the management and organisation of the university were subjected to independent scrutiny in preparation for the assumption of office by President Joël Mesot. What were the main results of this institutional review?

Robert Perich: The "Transition Review", the final report commissioned by the ETH Board, confirms an extremely positive and at the same time balanced overall picture of our organisation. The key message is that ETH has solid, efficient and appropriate structures and processes in place to meet its teaching, research and knowledge-transfer objectives. The independent auditors came to this conclusion after scrutinising ETH Zurich thoroughly over a period of three months.

What do the results of the Transition Review mean for the management of ETH Zurich?

The auditors confirm that the Executive Board is managing ETH effectively and efficiently. Cooperation between the Executive Board and the academic departments is also appropriately and effectively regulated. They note that the President has overall responsibility for the university and that the decision-making process is sustainable and broad-based. To sum up: the management and administration of the university are appropriate to the size of ETH and effectively support the core scientific mission.

What other conclusions did the auditors come to?

The audit covered the areas of management and supervision (governance), finance and controlling, legal and compliance, and real estate. In no area was there an urgent need for action. For example, we were given confirmation that ETH Zurich assesses possible conflicts of interest in a structured and regular manner, and that financial management processes are transparent and traceable. Furthermore, the information given in our annual report complies with disclosure standards and is also of interest to the federal government and the public.

In which areas is there room for improvement?

In the medium term, action is needed in two areas: in the case of real estate, the recommendations concern the identification of requirements and the need for a structured overview of the condition of the real estate portfolio. The auditors also recommend that the professors be given even more support in the performance of their management duties and that they be offered continuing education. We are also required to review the effectiveness of the available mechanisms for reporting misconduct.

What next? What conclusions were drawn from the Transition Review?

The audit results are a good basis for internal discussions on how we can further develop ETH and place it in an even better position to meet the challenges of the coming years. We have launched an internal organisational development project called rETHink, which covers all three governance levels – Executive Board, academic departments and professorships. The Transition Review confirms that we have the basics right: we can approach our further development from a position of strength, building on what we have already achieved as we look to the future. We do not have to reinvent ETH.

RISK MANAGEMENT:

A SYSTEMATIC
PROCESS

Risk management at ETH Zurich covers the entire institution and takes account of both internal and external risks. It takes its lead from ISO 31000, the internationally recognised risk management standard. Software is used to continually identify, analyse, document and monitor risks as part of a systematic process. This holistic approach also takes account of compliance, environmental and procurement risks. The goal of risk management is to safeguard tangible and intangible assets – resources which determine the university’s success. In particular, they include human capital, infrastructure and ETH’s reputation.

Legal foundations and governance

Based on the autonomy granted to each of the ETH Domain’s six institutions by the ETH Act and the mandate for teaching, research and service provision, each institution is individually responsible for managing risks and periodically reports the current risk situation to the ETH Board in its role as the university’s supervisory body. The essential parameters of risk management and risk financing are laid down in the ETH Board’s directive on risk management at ETH and the research institutions.

As the officeholder with overall responsibility for risk management at ETH Zurich, the ETH President informs the ETH Board on an annual

basis about the core risks, in particular the scope and extent of those risks, their potential impacts on the institution as well as any countermeasures already planned and implemented. The President also informs the ETH Board without delay of any exceptional changes to the risk profile or any instances of loss or damage.

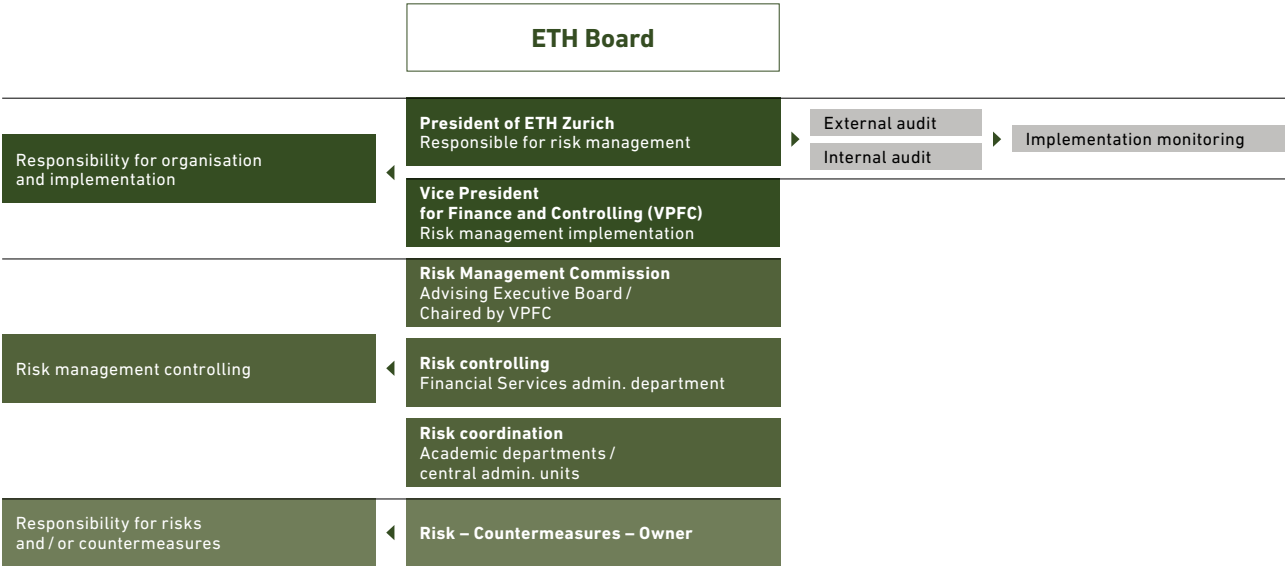
Organisation and process

Whereas the President has overall accountability for risk management, responsibility for implementation lies with the Vice President for Finance and Controlling. The latter chairs the Risk Management Commission, which advises the President and the Executive Board on matters concerning risk management, risk financing and insurance. The Commission decides what action to take in relation to the reporting, assessment, minimisation and controlling of risk, while overseeing the process as a whole.

The Executive Board is informed regularly about any substantive risks and their possible impacts, and on the progress of any countermeasures aimed at avoiding and mitigating risk. ETH Zurich has nominated one or more officers responsible for each core risk. Appropriate measures are in place to ensure that risk potential at the university is reduced to an acceptable minimum. Finally, if ETH Zurich’s risk capacity is exceeded, measures such as insurance policies are in place to cushion that risk.

INTERNAL CONTROL SYSTEM

An important instrument in relation to risk management is the internal control system (ICS), which evaluates relevant financial processes and corresponding risks, assures adherence to internal and external rules, and minimises risks through appropriate control measures. The ICS encompasses those procedures and measures that ensure accurate bookkeeping and accounting, which in turn form the basis of sound financial reporting. As an independent external auditor, the Swiss Federal Audit Office verifies the existence of the ICS implemented at ETH Zurich as part of the statutory audit of the annual financial statements.



CORE RISKS

Risks with potentially damaging impacts on the finances or reputation of ETH as a whole are designated as core risks.

- ETH's highly educated lecturers, researchers, students and support staff are a key factor for its success. The risk that persistent and structural factors could have a lasting **negative impact on academic performance in research and teaching** is therefore weighted correspondingly high.
- The **loss of financial resources** due to a significant reduction in allocated federal funding or a sustained drop in third-party contributions would have immediate consequences for the quality and quantity of ETH's teaching and research, and therefore represents a correspondingly high level of risk.
- ETH Zurich is tasked with providing education at the highest level. A severe deterioration in the quality of teaching, for example **due to changes in education policy or resource adjustments**, would represent a reputational risk. A shift in priorities in the field of education policy, followed by declining financial resources, would lead to a drop in the quality of teaching, falling student numbers and a decline in new academic talent.
- **Research integrity** is a key prerequisite for robust and subsequently sustainable scientific success. Lack of integrity can lead to data manipulation, plagiarism, non-disclosure of conflicts of interest and dereliction of duties of care towards junior scientists. Support from trusted intermediaries and the work of ETH's Commission for Good Scientific Practice actively promote integrity in research and its implementation in everyday practice.
- All of ETH Zurich's business processes are reliant on a fully functioning data network and secure data storage media. **Data losses, network failures or unauthorised data access** present considerable risks to ETH's business processes. A panel of technical experts and the Chief Information Security Officer continuously review the measures implemented to achieve the protection targets defined as part of IT security, and adjust them as necessary.
- **Rapid and open communication** about the core tasks of research, teaching and technology transfer, as well as institutional matters, strengthens trust among stakeholders, ensures social relevance and promotes the reputation of ETH Zurich. Failures of communication can lead to a loss of credibility and acceptance, incurring a loss of trust among key stakeholders in politics and society.
- **Violence or threats against the person** are not limited to actual physical aggression, but also manifest in threats of violence, abuse of power and forms of sexual harassment. Through preventive measures and constant reassessment of the current level of threat based on standardised instruments, the ETH Threat Team defuses problems and conflicts at an early stage, before they escalate into violence.
- **Large-scale damage to the real estate used by ETH Zurich but owned by the federal government** entails the risk that the infrastructure necessary for research, teaching and the management of ETH may be unavailable for an extended period, resulting in cancellation of important research and teaching activities in whole or in part. Measures to safeguard and increase the safety of buildings are an integral part of every new-build or modernisation project, with the aim of averting major incidents.
- **Adequate premises, both in terms of quantity and quality** are crucial for teaching and research and allow growth targets to be set. Partial or total loss of infrastructure within a room or an entire building can pose a threat to ETH Zurich's teaching and research activity. Lack of space and viable building plots jeopardises the achievement of growth targets.
- **To ensure the early detection of conflicts**, the support teams will be trained, information exchange between them intensified, information gathered, and the situation monitored. In the area of prevention, the main focus is on the training and support of supervisors, as well as on the structured onboarding and supervision of doctoral students, postdocs and other staff.

IMPLEMENTATION OF AN INTERNAL COMPLIANCE PROGRAMME (ICP) FOR EXPORT CONTROL

Export activity makes it essential to have an ICP in place so as to avoid risks and conflicts with export control regulations. Implemented in April 2019, the ICP gives the university the necessary protection. The newly developed e-learning module on export control raises staff awareness of this issue. Additional modules on topics such as research integrity, teaching, SSHE, IT security and data protection are also available.

COMMITTED TO SUSTAINABILITY

ETH Zurich is an international centre of excellence and a flagship for sustainability research, incorporating the principles of sustainable development in the core areas of research, education, campus, and dialogue with society.

Sustainability is one of ETH's strategic objectives. It aims to maintain and expand its international reputation in the fields of environmental, climate and nutritional research. To this end it defines thematic priorities that allow dynamic cooperation across disciplines. In research and teaching, on campus and in dialogue with society, ETH Zurich is a trendsetter when it comes to sustainability.

1. Research

Through its research activities, ETH Zurich furnishes the scientific and technical knowledge required for a sustainable society. To highlight and support this commitment, ETH Zurich has defined sustainability as one of five main focus areas in its Strategy and Development Plan 2017–2020. In addition to the broad spectrum of cutting-edge research in the academic departments, ETH Zurich can draw on the interdisciplinary expertise of its various centres of excellence in order to address major societal challenges such as future cities and the sustainable design of living spaces, food security, energy supply and climate change.

2. Education

ETH Zurich trains the next generation of specialists and experts to ensure they actively integrate sustainability aspects into their professional lives. In past decades, ETH has not only developed internationally acclaimed study programmes and other teaching formats, but has also established new departments and institutes to teach sustainability knowledge to its students. Moreover, ETH Zurich is keen to encourage intellectual agility by providing its students with the tools that will enable them to tackle socially and ethically relevant

aspects in their studies, in their professional careers and as responsible members of society.

3. Campus

On campus, ETH Zurich lives and promotes the principles of sustainable development with respect to social, environmental and financial aspects. As an employer, ETH Zurich aims to provide the best possible working conditions, including enabling and maintaining a participatory, respectful and diverse environment. The university endeavours to serve as a "living lab" which develops, implements and tests pioneering solutions that preserve natural resources and reduce environmental impacts. Finally, as a publicly funded university, ETH Zurich places great value on transparent budgeting and controlling, financial accountability, and adequate risk management.

4. Dialogue with society

ETH regularly informs the public about its latest research findings. It makes its scientific knowledge publicly available so as to make a significant contribution to the public debate around sustainable development. In accordance with its mandate, ETH Zurich has developed a range of formats and communication tools to provide information to the public in an accessible and comprehensible way. The university also provides a number of services for the federal government and makes its expertise available for decisions to be taken based on scientific facts.

▼ Sustainable campus:
a new power plant is being
installed under the Machine
Laboratory and ETH's former
district heating system.



TRANSPARENCY AND CREDIBILITY

ETH Zurich's reporting also reflects its commitment to sustainable development. Its energy report, first published in 2002, was developed into a broader environmental report in 2005. Since 2009/2010, the report has included all three areas of sustainability and gives comprehensive details of ecological, economic and social aspects. The Sustainability Report 2017/2018 provides an insight into developments, successes and challenges in the areas of research, education, campus and dialogue with society. Highlights from the reporting period and around 50 objectives complete the picture. The report also describes how ETH Zurich is helping to achieve the Sustainable Development Goals (SDGs) of the United Nations. These sustainability reports are notable for their high degree of stakeholder involvement; for their local, national and global reach; and for being certified by external auditors. All the sustainability reports are compiled in accordance with the ISCN Sustainable Campus Charter of the International Sustainable Campus Network and comply with the international Global Reporting Initiative standard.

www.ethz.ch/sustainability-report
www.ethz.ch/sustainability
www.ethz.ch/environment

ETH ZURICH EXECUTIVE BOARD 2019

Joël Mesot (1964)

was appointed Adjunct Professor at ETH Zurich in 2007 and a year later became Full Professor. Since August 2008 he has held a joint professorship in physics at ETH Zurich and EPFL. From 2008 to 2018 Mesot was Director of the Paul Scherrer Institute (PSI) in Villigen. He became President of ETH Zurich in January 2019.



Sarah Springman (1956)

has been Full Professor of Geotechnical Engineering at ETH Zurich since January 1997, heading the institute from 2001 to 2005 and again from 2009 to 2011. She also served as Joint Deputy Head of the Department of Civil, Environmental and Geomatic Engineering from 2013 to 2014. Since January 2015 she has been Rector of ETH and acts as deputy to the President.



Detlef Günther (1963)

has been Assistant Professor (from October 1998), Associate Professor (from July 2003) and Full Professor (from February 2008) of Trace Element and Microanalysis at the Laboratory of Inorganic Chemistry at ETH Zurich. Since January 2015 he has served as Vice President for Research and Corporate Relations at ETH Zurich.



Robert Perich (1961)

has a doctorate in business administration and has been Head of ETH's Finance and Controlling division since 2003 and Vice President for Finance and Controlling since October 2008. Before that, he worked for 11 years in the financial services industry, most recently as CFO and Member of the Executive Board of the Private Banking Switzerland division of a leading Swiss bank.



Ulrich Weidmann (1963)

has been Full Professor of Transport Systems at ETH Zurich since June 2004, and also served as Head of the Department of Civil, Environmental and Geomatic Engineering from 2013 to 2015. He became Vice President for Human Resources and Infrastructure in January 2016. He held various senior management roles with the Swiss Federal Railways (SBB) from 1994 to 2004.

Remuneration

In 2019, the salaries of the five members of the Executive Board, including the employer's social security contributions, came to CHF 2.16 million (last year: CHF 2.14 million). The total sum includes CHF 0.40 million (last year: CHF 0.38 million) for pension benefits and CHF 0.12 million for other social security contributions (last year CHF 0.12 million).

Secondary employment (as of 31 December 2019)

Joël Mesot: Member of the Senate of the Helmholtz Association of German Research Centres; Second Vice Chair of the Marcel Benoist Foundation; Member of the Foundation Board of the Swiss Science Center Technorama Winterthur; Member of the Scientific Policy Committee, SLAC National Accelerator Laboratory Board of Overseers; Member of the Global Member of the Board of Trustees and Network Advisory Board WEF Centre for the

Fourth Industrial Revolution; Member of Club des Quatre Saisons; Member of Governing Board, Geneva Science-Policy Interface

Sarah Springman: none

Detlef Günther: Member of the Board of Directors of GRS Gemresearch Swisslab AG

Robert Perich: Member of the University Council of the University of Cologne, Guest Lecturer on the CAS University Leadership and Governance at Universities programme at the University of Zurich

Ulrich Weidmann: Member of the Board of Directors: VBG Verkehrsbetriebe Glattal AG, Auto AG Schwyz. Member of the Arbitration Panel: Ceneri Base Tunnel (Rail Technology and Overall Coordination, Railtrack and Logistics). Trustee of the Board: Fachstelle für behindertengerechtes Bauen (buildings for the disabled)

ORGANISATION CHART 2019

As of 31 December 2019

◀ Ombudspersons

University Assembly ▶

EXECUTIVE BOARD AND CENTRAL ADMINISTRATIVE UNITS

Executive Board and General Secretariat

President Professor Joël Mesot					
	Rector Professor Sarah Springman	Vice President for Research and Corporate Relations Professor Detlef Günther	Vice President for Finance and Controlling Dr Robert Perich	Vice President for Human Resources and Infrastructure Professor Ulrich Weidmann	
					Secretary General Katharina Poiger Ruloff

Vice Rectors (VR) and Associate Vice Presidents (AVP)

AVPs for:	VRs for:
– ETH Global	– Study Programmes
– Equal Opportunities	– Curriculum Development
– Sustainability	– Doctoral Studies
– Digital Transformation	– Continuing Education

Staff units

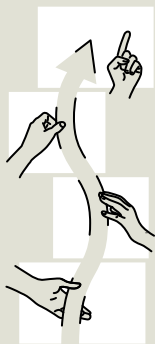
– President's Staff	– Rector's Staff	– Office of Research		– Office of Resources	– Legal Office
– Office for Faculty Affairs		– EU GrantsAccess			
– ETH Global		– ETH transfer			
– ETH Sustainability					
– Strategic Development					

Administrative departments

– Corporate Communications	– Academic Services		– Controlling	– Human Resources	
	– Student Services		– Accounting	– Real Estate Management	
	– Educational Development and Tech- nology		– Financial Services	– Facility Management	
				– IT Services	
				– ETH Library	
				– Services	
				– Safety, Security, Health and Environment	

ACADEMIC DEPARTMENTS

Architecture and Civil Engineering	Engineering Sciences	Natural Sciences and Mathematics	System-oriented Natural Sciences	Management and Social Sciences
Architecture	Mechanical and Process Engineering	Mathematics	Earth Sciences	Management, Technology, and Economics
Civil, Environmental and Geomatic Engineering	Information Technology and Electrical Engineering	Physics	Environmental Systems Science	Humanities, Social and Political Sciences
	Computer Science	Chemistry and Applied Biosciences	Health Sciences and Technology	
	Materials	Biology		
	Biosystems Science and Engineering			



GOVERNANCE AND SUSTAINABILITY OVERVIEW

FREEDOM TO SUCCEED

The management structure that characterises ETH Zurich combines a distinctly presidential system with broad participation rights and freedom of action.

Freedom and individual responsibility, entrepreneurial spirit and open-mindedness: ETH Zurich stands on a bedrock of true Swiss values.

At ETH Zurich, students discover an ideal environment for independent thinking, and researchers a climate which inspires top performance. Situated in the heart of Europe, yet forging connections all over the world, ETH Zurich is pioneering effective solutions to the global challenges of today and tomorrow.

Together with EPFL and the four research institutes Eawag, WSL, Empa and PSI, ETH Zurich forms part of the **ETH Domain**, a closely cooperating network which places Swiss research in an excellent position at international level. Elected by the Federal Council, the **ETH Board** is the ETH Domain's strategic management and supervisory body.

Within ETH Zurich, the **President** bears overall responsibility, specifically in the areas of strategy and finance. They nominate vice presidents (members of the Executive Board) and professors for appointment by the ETH Board. This is counterbalanced by a well-established system of participation, which guarantees acceptance of the decisions taken as a form of quality assurance across the whole institution. Within this broad-based decision-making process, a key role is played not only by the Executive Board, but also by the academic departments and the University Assembly, a university-wide body in which the teaching staff, the scientific staff, the students and the administrative and technical staff are equally represented.

As the principal governing body of ETH Zurich, the **Executive Board** is committed to ensuring that the university fulfils its social and economic responsibilities. It is currently made up of the President, Rector (Vice President for Education,

nominated by the professors), Vice President for Research and Corporate Relations, Vice President for Finance and Controlling, and Vice President for Human Resources and Infrastructure.

The Executive Board issues study regulations and regulates the organisation of the university. It decides on the establishment and closing down of departments and other units, such as interdepartmental competence centres. It also elects the vice rectors and associate vice presidents with special duties, and makes employment decisions for ETH staff. The Executive Board works with various participatory bodies. In particular, it holds regular discussions with the University Assembly. The Executive Board is also consulted by the President on all questions of strategy and finance. It is assisted by advisory committees.

ETH Zurich has deliberately chosen a flexible departmental structure with department heads who are committed to science. This ensures diversity, professional depth and the freedom necessary for long-term scientific success. The **16 academic departments** of ETH report to the Executive Board. These bring together members of the university who are active in a specific scientific field at the organisational level and ensure teaching, research and services in the field in question. They are divided into institutes or laboratories, professorships and departmental facilities.

The academic departments are responsible for their own strategic planning, running their degree courses and coordinating their research. The principal authority within each academic department is the Department Conference. It includes all professors, representatives of the other teaching staff and representatives of the students, scientific staff and administrative

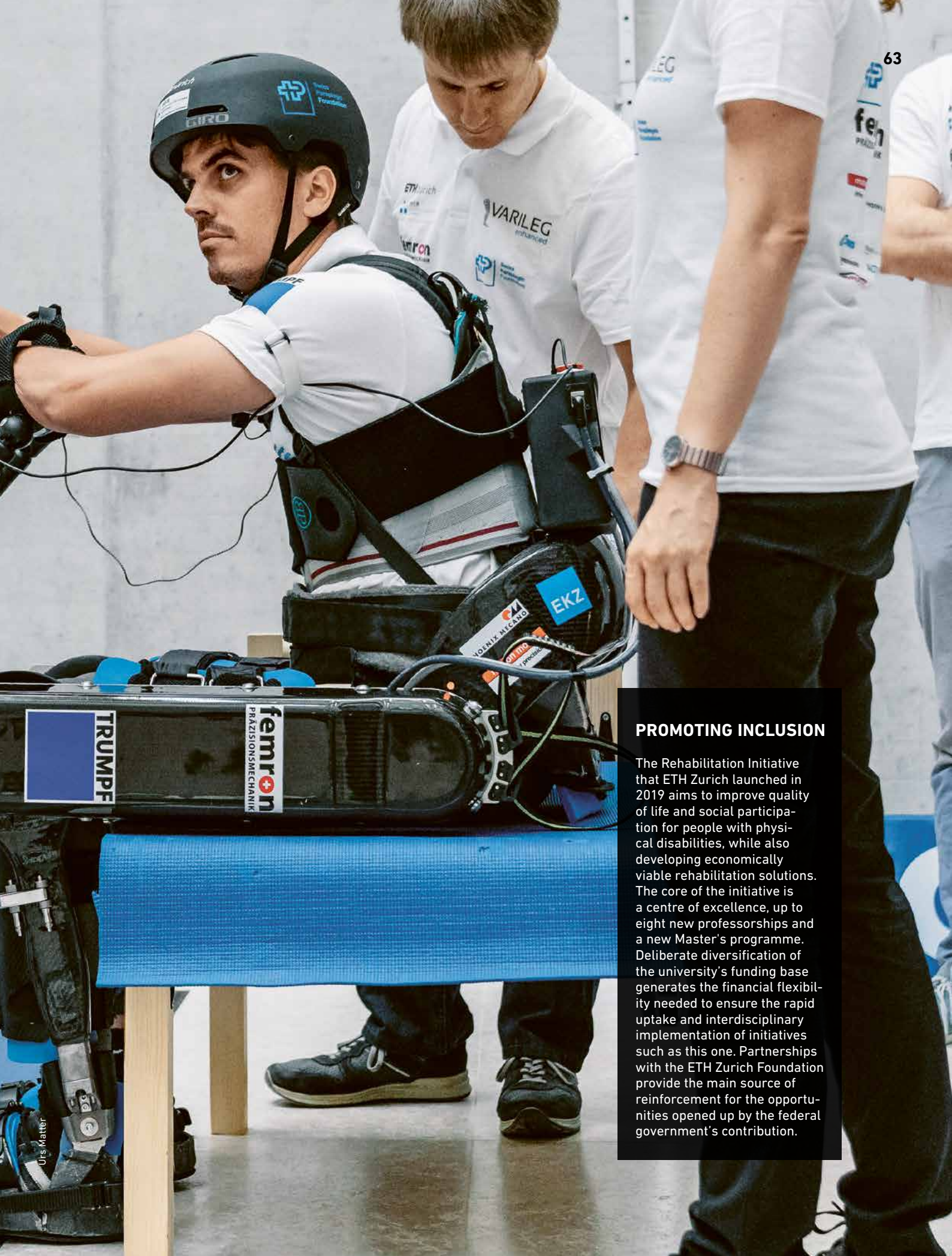
and technical staff. It is responsible for planning and defining the scope of professorships, adopting study programme regulations, nominating department heads and electing directors of studies.

Institutional dialogue between the Executive Board and the academic departments takes place through the Conference of the Heads of Department and the Conference of the Directors of Study, as well as through dialogue between departmental management and the Executive Board.

Independence in teaching and research as well as strategic and financial freedom to act are vital in order for ETH Zurich to strengthen Switzerland's position as a major centre of research, compete against the world's leading institutions for technology-intensive research and keep its place at the top of global rankings. The total contribution from the federal government (global budget), growing at a steady rate, provides a secure foundation for this. Targeted diversification of funding sources, together with reserves that have been accrued through responsible funding management, allow more reliable planning. They also help ensure sustainable development that takes account of the issues making an impact on today's society – and the ones that will make an impact on the future.

A person wearing black gloves is giving a thumbs up gesture. Next to them is a black tripod on a blue floor. The word 'FINANCE' is written vertically in large white letters on the right side of the image.

FINANCE



PROMOTING INCLUSION

The Rehabilitation Initiative that ETH Zurich launched in 2019 aims to improve quality of life and social participation for people with physical disabilities, while also developing economically viable rehabilitation solutions. The core of the initiative is a centre of excellence, up to eight new professorships and a new Master's programme. Deliberate diversification of the university's funding base generates the financial flexibility needed to ensure the rapid uptake and interdisciplinary implementation of initiatives such as this one. Partnerships with the ETH Zurich Foundation provide the main source of reinforcement for the opportunities opened up by the federal government's contribution.

THE KEY TO GREATER FLEXIBILITY

Digitalisation affects not only teaching, research and knowledge transfer at ETH Zurich, but also finances, human resources and procurement. The revised ETH Information and Support system (ETHIS) simplifies digital administrative operations.

By Florian Meyer and
Simone Roggenbuck

Digitalisation is changing the world of work. IT infrastructures, web applications and apps provide new opportunities for structuring workflows and business processes in a future-oriented, flexible way.

The world of science is no exception: higher education and cutting-edge research, such as that carried out by ETH, are becoming more global and connected. For example, the professorships recruit their researchers from around the world. In financial and HR administration, flexible and effective tools are an advantage when it comes to supporting teaching and research in a globally competitive environment.

Innovative approaches to research, for example, often emerge when researchers from different disciplines pool their expertise. For this reason, many research initiatives today are carried out in collaboration with various partners and sponsors. Hence, the share of third-party

funding alongside the basic funding from the federal government is increasing. Such mixed financing has to be reported to the individual donors in different ways. This in turn increases the demands on an internal financial system and the transparency requirements regarding the use of funds.

Reducing complexity, increasing transparency

The ETH internal financial system must be flexible so that professorships can act quickly: in procuring laboratory equipment when new research technologies become established, for example. At the same time, the system has to provide a clear representation of complex financial flows in order to ensure transparency for donors. In the case of ETH Zurich, this applies in particular to the federal government, from which it receives over two thirds of its budget. Since ETH gained institutional autonomy in the year 2000, it has implemented its education, research and innovation strategy within the framework of a global budget and managed its funds independently.

In 2015, ETH launched the "refine" project. Its goal is to simplify the internal financial system and bring it into line with the International Public Sector Accounting Standards (IPSASs). In January 2019, the university successfully revised its internal financial system and launched a new resource and finance platform. It is based on S/4HANA, the latest SAP business software. ETH is among the first three universities in the world to use this system. On the first day alone, the new system processed over 1,200 customer invoices and 600 HR-related workflows without a hitch. Today it handles 12–13,000 invoices per month.

A model for digital financial management

"With the new resource and finance platform, ETH has become a model for others to follow in digital financial management," says Robert Perich, chair of the refine project's steering committee. "With this project, ETH is sending a very important signal," adds Stephan Wagner, Professor and Chair of Logistics Management and a member of the steering committee. "With refine, we are showing that ETH Zurich not only teaches and conducts research on digitalisation in business and society, but that we, as



► Robert Perich,
Vice President
for Finance and
Controlling and
chair of the
refine steering
committee

▼
Stephan Wagner,
Professor and Chair
of Logistics Manage-
ment and member
of the refine steering
committee



a university, also implement and practise digitalisation ourselves," says Wagner.

ETH has been awarded several prizes for refine, having been a winner at the 2018 SAP Innovation Awards and taken second place in the Best Modernisation Project category of the 18th eGovernment competition in 2019, in recognition of the university's efforts to be at the forefront of digital financial infrastructure.

"The awards are welcome recognition for all 90 employees who have put so much effort into refine," says ETH Vice President Perich. He believes the deliberate involvement of ETH's own specialists was a key factor in the refine project's success.

More comprehensive resource management

"The new system will significantly increase the entrepreneurial scope of the professorships and academic departments in teaching, research and knowledge transfer," says Perich. Professorships can now transfer unused budgets, freed from their original intended purpose, to a reserve and use these funds at a later time when needed. This flexibility allows it to pre-finance a project or put money aside if, for example, top candidates for a position are not available until later. Wagner believes that cross-period financial planning is one of the most important innovations – along with the fact that typical activities such as research projects and the procurement of laboratory equipment can be better structured and more

transparently represented. "The new system provides a more comprehensive means of resource management, as the professorships now have an integrated view of all available budgets," says Robert Perich.

A valuable tool for research management and administration

The user interface is identical to ETH's own information and support portal, ETHIS, which staff have been familiar with for years. Technically, however, the system was completely rebuilt on the basis of S/4HANA. No components of the old system were transferred other than the data. "HANA lays the foundation for the future. The technology has the advantage that large amounts of financial data are stored and processed directly in the main memory," says Markus Knaus, co-leader of the refine project. Data in the main memory can be accessed 100,000 times faster than on the hard drive. This makes it easier to manage the enormous complexity of information that is typical of research partnerships and ETH Zurich as a whole.



◀
Markus Knaus,
Head of the
Controlling
department and
co-leader of the
refine project

SOURCES OF FUNDS

At a political level, the ETH Domain is managed through strategic objectives set by the Federal Council, the term and content of which are tailored to the federal government-approved funding. Based on the strategic objectives, the ETH Board enters into target agreements with the two federal institutes of technology and the four research institutes and allocates the federal funds.

In 2019, the federal financial contribution granted to ETH Zurich (global budget) amounted to 1,298 million Swiss francs. The global budget is used, firstly, to cover basic teaching and research equipment (expenditure credit or federal financial contribution in the narrower sense) and, secondly, to fund investments in the properties used by ETH Zurich (investment credit), most of which are owned by the federal government. These properties are managed within the central federal administration by the Federal Office for Buildings and Logistics (FOBL).

Global budget (CHF million)

	2019	2018	Absolute change
Expenditure credit (ETH Zurich financial statements)	1,158	1,177	-19
Investment credit (FOBL/Federal Government financial statements)	140	124	17
Federal financial contribution (global budget)	1,298	1,300	-2
Dedicated reserves released (+)/ recognised (-) (investment credit, FOBL/Federal Government financial statements) ¹	10	-40	50
Total (recognised in income)	1,308	1,260	48

¹ For the portion of the investment credit remaining in the previous year (40 million Swiss francs) as a result of delays to a new building in Basel, dedicated reserves in the same amount were recognised for the first time in the FOBL's financial statements following parliamentary approval. In the previous year, these reserves were not recognised in income for ETH Zurich. In 2019, the Federal Finance Administration approved the release of 10 million Swiss francs of these dedicated reserves, which were available to ETH Zurich in the reporting period as income for a specified purpose.

Consolidated third-party funding amounted to 551 million Swiss francs and consisted of project-oriented research contributions, grants and self-generated revenues. Together with the global budget of 1,308 million Swiss francs recognised in income, ETH Zurich's total income came to 1,859 million Swiss francs in 2019.

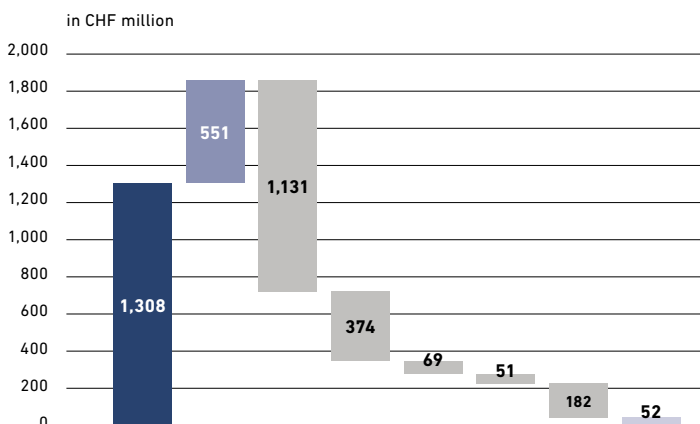
USE OF FUNDS

Funds are used, firstly, to cover personnel expenses for teaching, research and administration and, secondly, to finance construction spending, other operating expenses and investments in movable assets. This produced consolidated net income of 52 million Swiss francs. Third-party funding not used immediately in 2019 was mostly added to financial assets.

Construction spending in connection with the development and management of the property portfolio amounted to a total of 233 million Swiss francs in 2019 and was financed through the investment credit (150 million Swiss francs), the expenditure credit (72 million Swiss francs) and third-party funding (11 million Swiss francs).

The extensive and varied property portfolio managed by ETH Zurich comprises a large number of dedicated teaching and research buildings designed with their particular purpose in mind and fitted out to suit their specific teaching and research requirements. In total, it contains 175 buildings and facilities and 68 plots of land. The carrying amount of the plots of land was 691 million Swiss francs at the end of 2019. The buildings were stated in the accounts at a value of 1,325 million Swiss francs at the end of 2019 and their replacement cost (gross cost) was 3,608 million Swiss francs.

Income (CHF 1,859 million) and its use



- Expenditure credit and investment credit (recognised in income) 1,308
- Third-party funding (consolidated) 551
- **Use (consolidated)**
- Personnel expenses 1,131
- Other operating expenses excl. construction spending (not capitalised) 374
- Other operating expenses excl. construction spending (capitalised)¹ 69
- Construction spending (not capitalised) 51
- Construction spending (capitalised)¹ 182
- **Net income (consolidated)² 52**

- 1 Under IPSASs, investment expenditure (251 million Swiss francs) is capitalised, presented in the balance sheet and depreciated over the useful life of the asset, with the charges recognised in surplus or deficit.
- 2 Consolidated net income (52 million Swiss francs) was 41 million Swiss francs lower than the consolidated surplus in accordance with IPSASs (93 million Swiss francs) due to specific effects of accounting requirements (mainly revenues on an accrual basis, the net defined benefit liability and the share of surplus or deficit of associated entities).

RESPONSIBLE FUNDING MANAGEMENT

To be able to respond appropriately to developments in teaching and research, ETH Zurich requires financial flexibility and reliable planning. This can only be achieved with secure long-term funding. In this context, it is vital for the university to selectively diversify its sources of funding and manage funds responsibly and cost-effectively.

2019 was another year of sustained growth for ETH Zurich. The number of students increased again, rising by almost 800, or 4 percent, compared with 2018. This brings the total increase over the last 10 years to over 40 percent. The university's mission to deliver high quality and excellence presents continuous challenges, which it meets by developing and expanding teaching and research capacity and making selective investments in infrastructure. Whilst reflecting the growth, consolidated operating expenses in accordance with IPSASs held relatively steady year on year at 1,804 million Swiss francs, including one-time items. Total consolidated revenue in accordance with IPSASs rose by 3 percent to 1,897 million Swiss francs and included higher income from the share of surplus or deficit of associated entities, higher net finance income and lower operating revenue (down by 4 percent). Details on the annual consolidated financial statements can be found on page 69 onwards.

Strategic and financial freedom are essential if ETH Zurich is to compete internationally and successfully manage the expected growth. This freedom is underpinned to a large extent by a long-term, sustainable financial policy, based on a financial plan covering a period of several years, long-term balance sheet management and a modern approach to financial governance.

The federal financial contribution (global budget) and its stable trajectory provide a reliable basis for this. Selective diversification of funding sources, together with the third-party funding reserves accrued through responsible, cost-effective funding management, allow for more reliable planning. The reserves ensure strategic flexibility; one way they are put to use is through supporting initiatives like ETH+, which aims to expand interdisciplinary engagement, address new strategic topics, and create additional professorships in cutting-edge fields of knowledge.

Some of the third-party funding not required immediately for ETH Zurich's operations is invested in the financial market in accordance with the applicable treasury agreement and the investment guidelines stipulated by the ETH Board. The investment strategy places the focus on a return reflecting an adequate risk profile for ETH Zurich (low volatility) in combination with sustainability and cost efficiency. In terms of sustainability, several significant milestones were passed back in 2017. Firstly, all investments are subject to the exclusion list published by the Swiss Association for Responsible Investments (SVVK-ASIR). Secondly, where possible under asset management mandates, funds are invested in products that follow a sustainability approach in accordance with ESG

(environmental, social, governance) criteria. ETH Zurich is keen to extend its sustainability endeavours in a rapidly evolving market for sustainability-related products. In the interests of cost efficiency, it invests mainly in passively managed mandates. New developments in indexed fund products with a sustainability focus are therefore of particular interest.

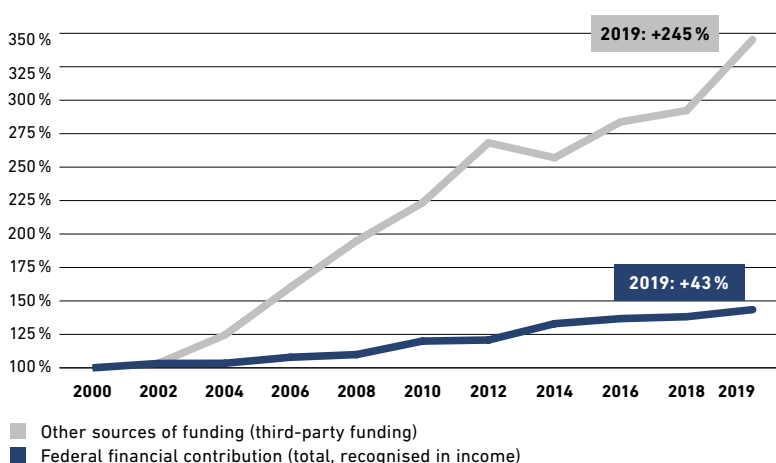
The selective diversification of the funding base is reflected in the increase in third-party funding (2019: 551 million Swiss francs) as a proportion of total income (2019: 1,859 million Swiss francs). This rose from 15 percent in 2000 to around 30 percent in 2019, underscoring its growing importance.

Currently, more than two thirds of third-party funding comes from competitive research funding projects at national and European level. Competitive research funding from national organisations such as the Swiss National Science Foundation (SNSF) or Innosuisse and from EU programmes (Horizon 2020, ERC Grants) is of major relevance, as are collaborations with industry. Research funding in connection to projects with the federal government (research initiated by the Federal Administration because it needs the results of this research to fulfil its tasks: *Ressortforschung*), cantons, local authorities and various international organisations is also of importance.

Third-party funding also includes grants (donations, legacies/bequests). By far the largest share of the grants comes through the ETH Zurich Foundation. Finally, a further portion of third-party funding is attributable to self-generated revenues. These include tuition fees, various items of service revenue and net finance income.

It is vital for ETH Zurich to manage the third-party funding entrusted to it responsibly and in conformity with its strategy. Its top priority is to maintain its independence in teaching and research. Defined guidelines with clearly communicated principles, such as the ETH Zurich Code of Conduct for Scientific Collaboration, the ETH Zurich Code of Conduct for Dealing with Contributions or the ETH Zurich Foundation Code of Conduct, ensure that it does so.

Development of ETH Zurich income structure (2000 = 100 %)



FINANCIAL ACCOUNTING AND REPORTING
IN ACCORDANCE WITH IPSASs

ANNUAL CONSOLIDATED FINANCIAL STATEMENTS IN BRIEF

The annual consolidated financial statements were prepared in accordance with International Public Sector Accounting Standards (IPSASs). ETH Singapore SEC Ltd. and the Rübel Geobotanical Research Institution Foundation are consolidated in the annual financial statements. The ETH Zurich Foundation and several independent foundations are reported as investments in associated entities.

A consolidated surplus of 93 million Swiss francs was reported for 2019 (an increase of 40 million Swiss francs or 76 percent compared with the previous year). It comprised the operating deficit of 15 million Swiss francs (a deterioration of 88 million Swiss francs), the share of surplus/deficit of associated entities of 75 million Swiss francs (an increase of 86 million Swiss francs) and net finance income of 33 million Swiss francs (an increase of 42 million Swiss francs).

The operating revenue generated in 2019 amounted to 1,789 million Swiss francs (a decrease of 79 million Swiss francs or 4 percent compared with the previous year). The total federal contribution, which is made up of the federal financial contribution (in the narrower sense) and the contribution to accommodation, dropped to 1,298 million Swiss francs (a decrease of 28 million Swiss francs or 2 percent). Revenue from donations and bequests was down sharply year on year to 64 million Swiss francs (a decrease of 72 million Swiss francs or 53 percent). Revenue from research contributions, on the other hand, rose to 357 million Swiss francs (an increase of 20 million Swiss francs or 6 percent).

Operating expenses were up slightly to 1,804 million Swiss francs in 2019 (an increase

of 9 million Swiss francs compared with the previous year). This rise was the result of higher personnel expenses (up by 39 million Swiss francs or 3 percent). These climbed mainly because of the rise in average full-time equivalents by 317 FTEs to 9,845 FTEs (an increase of 3 percent). Despite an increase in user-specific improvements due to new construction projects, other operating expenses declined (by 39 million Swiss francs or 8 percent) as a result of the higher volume of leasehold improvements capitalised. The latter climbed mainly because of a change in capitalisation practice.

Total consolidated assets rose by 190 million Swiss francs (7 percent) to 2,893 million Swiss francs at the end of 2019. Consolidated liabilities were up by 146 million Swiss francs on the previous year to 2,160 million Swiss francs due mainly to the increase in net defined benefit liabilities and dedicated third-party funds. Consolidated equity rose by 44 million Swiss francs to 733 million Swiss francs. The rise was driven by higher dedicated reserves (up by 179 million Swiss francs), mostly for teaching and research, and the positive trend in reserves from associated entities (up by 75 million Swiss francs). Conversely, free reserves declined by 152 million Swiss francs, mainly reflecting commitments made by the Executive Board in order to promote strategic projects. A further reduction was attributable to the rise in negative valuation reserves (which widened by 49 million Swiss francs), primarily as a result of cumulative actuarial losses on the net defined benefit liability. Overall, the equity ratio remained unchanged year on year at 25 percent at the end of 2019.

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86	14 Receivables	107	33 Events after the reporting date
		108	Report of the statutory auditor

Rounding differences: the figures presented in this document may not add up precisely to the total amounts presented in the tables. Changes are calculated on unrounded amounts and may differ from a figure that is based on the rounded amounts presented in the tables.

CONSOLIDATED STATEMENT OF FINANCIAL PERFORMANCE

CHF million	Note	2019	2018
Federal financial contribution		1,158	1,177
Federal contribution to accommodation		140	149
Total federal contribution	4	1,298	1,326
Tuition fees, continuing education	5	28	24
Swiss National Science Foundation (SNSF)		125	124
Swiss Innovation Agency (Innosuisse)		21	22
Special federal funding of applied research		36	26
EU Framework Programmes for Research and Innovation (FP)		67	64
Industry-oriented research (private sector)		61	60
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)		46	42
Research contributions, mandates and scientific services	6	357	337
Donations and bequests	7	64	136
Other revenue	8	42	44
Operating revenue		1,789	1,868
Personnel expenses	9	1,172	1,133
Other operating expenses	10	496	536
Depreciation	18, 20	110	104
Transfer expenses	11	27	23
Operating expenses		1,804	1,795
Operating result		- 15	72
Net finance income/expense	12	33	- 9
Share of surplus/deficit of associated entities and joint ventures	17	75	- 11
Surplus (+) or deficit (-)		93	53

CONSOLIDATED BALANCE SHEET

CHF million	Note	31.12.2019	31.12.2018
Assets			
Cash and cash equivalents	13	168	183
Current receivables from non-exchange transactions	14	306	241
Current receivables from exchange transactions	14	24	18
Current financial assets and loans	19	1,063	1,011
Inventories	15	6	5
Prepaid expenses and accrued income	16	22	27
Total current assets		1,588	1,485
Property, plant and equipment	18	477	441
Intangible assets	18	4	5
Non-current receivables from non-exchange transactions	14	604	627
Non-current receivables from exchange transactions	14	0	0
Investments in associated entities and joint ventures	17	168	93
Non-current financial assets and loans	19	5	4
Co-financing	20	47	48
Total non-current assets		1,304	1,218
Total assets		2,893	2,703
Liabilities and equity			
Current liabilities	21	68	60
Current financial liabilities	22	0	0
Accrued expenses and deferred income	23	74	75
Short-term provisions	24	48	49
Short-term liabilities		190	185
Dedicated third-party funds	26	776	726
Non-current financial liabilities	22	19	19
Net defined benefit liabilities	25	1,145	1,056
Long-term provisions	24	31	28
Long-term liabilities		1,970	1,829
Total liabilities		2,160	2,014
Valuation reserves		-699	-650
Dedicated reserves		978	798
Free reserves		331	483
Co-financing	20	47	48
Reserves from associated entities	17	168	93
Accumulated surplus (+)/deficit (-)		-92	-84
Total equity		733	689
Total liabilities and equity		2,893	2,703

CONSOLIDATED STATEMENT OF CHANGES IN EQUITY

CHF million	Valuation reserves	Donations and bequests	Teaching and research reserves	Infrastructure and administration reserves	Dedicated reserves	Free reserves	Co-financing	Reserves from associated entities	Accumulated surplus (+)/deficit (-)	Total equity
	a	b	c	d		e		f	g	
2019										
As of 1.1.2019	- 650	484	254	60	798	483	48	93	- 84	689
Surplus (+) or deficit (-)									93	93
Revaluation of net defined benefit liabilities	- 50									- 50
Revaluation of financial assets	2									2
Total items directly recognised in equity	- 48									- 48
Increase (+)/decrease (-) in reserves	0	- 6	170	14	179	- 152	- 2	75	- 101	0
Total changes	- 48	- 6	170	14	179	- 152	- 2	75	- 8	45
As of 31.12.2019	- 699	479	424	74	978	331	47	168	- 92	733
2018										
As of 1.1.2018	- 527	389	177	57	623	540	50	104	- 31	759
Surplus (+) or deficit (-)									53	53
Revaluation of net defined benefit liabilities	- 123									- 123
Revaluation of financial assets	0									0
Total items directly recognised in equity	- 123									- 123
Increase (+)/decrease (-) in reserves	0	96	77	3	175	- 57	- 2	- 11	- 106	0
Total changes	- 123	96	77	3	175	- 57	- 2	- 11	- 53	- 70
As of 31.12.2018	- 650	484	254	60	798	483	48	93	- 84	689

- a The negative valuation reserves (CHF - 699 million as of 31 December 2019) mainly comprise cumulative net actuarial and investment losses on the net defined benefit liability (not recognised in surplus or deficit). Details can be found in note 25.
- b Dedicated donation and bequest reserves declined to CHF 479 million, as funds used exceeded new donation agreements signed (previous year: CHF 484 million). The funds presented in this item are subject to contractually specified conditions or have a contractually specified purpose.
- c Dedicated teaching and research reserves rose by CHF 170 million to CHF 424 million due especially to new projects. The reserves included election commitments to newly appointed professors of CHF 119 million as of 31 December 2019 (previous year: CHF 107 million).
- d Dedicated infrastructure and administration reserves rose as a result of the higher risk capital (CHF +14 million).
- e Free reserves reflect funds that originate from self-generated revenues (including treasury) or completed research projects that show a surplus. The CHF 152 million reduction in free reserves related in particular to

financial commitments made by the Executive Board in order to promote strategic projects. Commitments were made, among others, to the ETH PSI centre for quantum computing (CHF 30 million), in connection with the ETH+ initiative (CHF 28 million), to furnish the new building for the Department of Biosystems Science and Engineering in Basel with scientific equipment (CHF 25 million) and to provide initial funding for additional professorships (CHF 23 million). Funds were also allocated to dedicated reserves in connection with the HPCN strategy (new generation of supercomputers) (CHF 32 million).

- f Reserves from associated entities comprise ETH Zurich's share of the equity of the ETH Zurich Foundation and other independent foundations. Changes reflect its share of the associated entities' surplus or deficit in the reporting period (see notes 17 and 32).
- g The accumulated deficit is the residual of total equity less the reserve items presented separately. It shows the cumulative results at the reporting date and comprises the surplus/deficit carried forward, the surplus/deficit for the period and increases/decreases in the reserves in equity.

CONSOLIDATED CASH FLOW STATEMENT

CHF million	Note	2019	2018
Cash flows from operating activities			
Surplus (+) or deficit (–)		93	53
Depreciation	18, 20	110	104
Share of surplus/deficit of associated entities and joint ventures		–75	11
Net finance income/expense (non-cash)		–25	11
Increase/decrease in net working capital		–60	–25
Increase/decrease in net defined benefit liabilities	25	39	41
Increase/decrease in provisions (short- and long-term)	24	1	–1
Increase/decrease in non-current receivables	14	27	–131
Increase/decrease in dedicated third-party funds	26	50	63
Reclassification and other (non-cash) income		–6	1
Cash flows from operating activities		153	127
Cash flows from investing activities			
Investments			
Purchase of property, plant and equipment	18	–138	–99
Purchase of intangible assets	18	–1	–3
Increase in co-financing	20	0	0
Increase in loans	19	0	–1
Increase in current and non-current financial assets	19	–76	–48
Total investments		–215	–151
Divestments			
Disposal of property, plant and equipment	18	0	0
Disposal of intangible assets	18	0	0
Decrease in co-financing	20	0	0
Decrease in loans	19	0	0
Decrease in current and non-current financial assets	19	47	15
Total divestments		47	15
Dividends received from associated entities and joint ventures	17	0	0
Cash flows from investing activities		–168	–135
Cash flows from financing activities			
Increase in short-term and long-term financial liabilities	22	0	0
Decrease in short-term and long-term financial liabilities	22	0	0
Cash flows from financing activities		0	0
Total cash flow		–15	–9
Cash and cash equivalents at the beginning of the period (1.1.)	13	183	192
Total cash flow		–15	–9
Cash and cash equivalents at the end of the period (31.12.)	13	168	183
Contained in the cash flows from operating activities:			
Dividends received		4	3
Interest received		0	2
Interest paid		–1	–1

NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

1 Business activity

ETH Zurich is one of the leading international universities for technology and the natural sciences. It is well known for its excellent education, ground-breaking fundamental research and for implementing its results directly into practice.

Founded in 1855, ETH Zurich today has 22,200 students from over 126 countries, including 4,170 doctoral students. It offers researchers an inspiring working environment and its students a comprehensive education. Twenty-one Nobel Laureates have studied, taught or conducted research at ETH Zurich, underlining the excellent reputation of the university.

2 Basis of accounting

These financial statements are consolidated financial statements covering the reporting period from 1 January 2019 to 31 December 2019. The reporting date is 31 December 2019. The reporting is prepared in Swiss francs (CHF). All figures are shown in millions of Swiss francs (CHF million) unless indicated otherwise.

Legal basis

The legal basis of ETH Zurich's accounting is formed of the version of the following (including directives and regulations) in effect in the reporting period:

- Federal Act on the Federal Institutes of Technology of 4 October 1991 (FIT Act; SR 414.110)
- Ordinance on the Domain of the Swiss Federal Institutes of Technology of 19 November 2003 (Ordinance on the ETH Domain; SR 414.110.3)
- Ordinance on the Finance and Accounting of the ETH Domain of 5 December 2014 (SR 414.123)
- Accounting Manual for the ETH Domain (Version 6.4)

Accounting standards

The annual consolidated financial statements of ETH Zurich have been prepared in accordance with the International Public Sector Accounting Standards (IPSASs). The underlying accounting provisions are set out in the Accounting Manual for the ETH Domain (Art. 34 Directives, Ordinance on the Finance and Accounting of the ETH Domain, SR 414.123).

IPSASs adopted in the reporting period

IPSAS 40	Public Sector Combinations (effective as of 1 January 2019)
Various	Improvements to IPSAS, 2018 (effective as of 1 January 2019)

IPSAS 40 was applied prospectively, with no combination taking place in the reporting period. The Improvements to IPSAS, 2018 had only a minor impact on the disclosures related to liabilities arising from financing activities.

IPSASs issued but not yet applied

The following IPSASs were issued or amended before the reporting date. They only become effective later on and have not been early applied in these annual consolidated financial statements. The effective date is given in brackets.

IPSAS 41	Financial Instruments; replaces IPSAS 29 (1 January 2022)
IPSAS 42	Social Benefits (1 January 2022)
Various	Amendments to IPSAS 36 Investments in Associates and Joint Ventures and IPSAS 41 Financial Instruments (1 January 2022)

The effects on the annual consolidated financial statements are being systematically analysed. So far, however, no material effects on the annual consolidated financial statements are expected.

3 Accounting policies

The accounting policies are derived from the basis of accounting. The annual consolidated financial statements present a true and fair view of ETH Zurich's financial position, financial performance and cash flows.

The consolidated financial statements are based on historical cost. Exceptions to this rule are described in the following presentation of the accounting principles.

The annual consolidated financial statements of ETH Zurich are included in the consolidated financial statements of the ETH Domain.

Consolidation

The annual consolidated financial statements of ETH Zurich comprise the financial statements of ETH Zurich and of all entities which ETH Zurich controls directly or indirectly. The carrying amounts of investments in associated entities are also included in the consolidated financial statements.

Control means that, through its involvement with the entity, ETH Zurich has the power to direct the relevant activities of the entity and thus the ability to affect the nature and amount of benefits. At the same time, the controlling entity is exposed, or has rights, to variable benefits. ETH Zurich normally has the ability to control if it directly or indirectly holds more than 50 percent of the voting rights or potential voting rights of the entity. These entities are consolidated.

Entities are consolidated on the basis of the single-entity financial statements of ETH Zurich and the controlled entities. Receivables, liabilities, revenue and expenses from transactions between the consolidated entities as well as ownership interests and unrealised intra-economic entity surpluses are

eliminated on consolidation. All financial statements are prepared in accordance with uniform policies and normally as at the same reporting date. Due to time constraints, it is sometimes necessary to use prior-year financial statements for controlled entities rather than the financial statements as at 31 December of the reporting period. The prior-year financial statements used make up an insignificant portion of the consolidated financial statements of ETH Zurich and are adjusted for significant transactions between the prior-year reporting date and 31 December of the reporting period.

Investments in entities newly acquired in the course of the reporting period are included in the annual consolidated financial statements if they meet the consolidation criteria and exceed the thresholds defined in the Ordinance on the Finance and Accounting of the ETH Domain two years in succession. Entities which are sold are included up until the date on which control is lost, which is usually the date of disposal.

Associated entities are entities where ETH Zurich has significant influence, but not control. ETH Zurich normally has significant influence over an associated entity if it holds a 20 to 50 percent share of the voting rights. These investments are not consolidated, but are instead accounted for using the equity method and recognised in "Investments in associated entities and joint ventures". Under the equity method, the carrying amount of an investment is its cost, which is subsequently adjusted to reflect any changes in the associated entity's net assets (in proportion to ETH Zurich's share in the associated entity).

An overview of the controlled and associated entities can be found in note 32.

Currency translation

Transactions in a currency other than the functional currency are translated using the exchange rate at the transaction date.

At the reporting date, monetary items in foreign currencies are translated at the closing rate and non-monetary items using the exchange rate at the transaction date. The resulting currency translation differences are recognised as finance income or finance expense.

Assets and liabilities of controlled entities with a different functional currency are translated at the closing rate, and the statement of financial performance and cash flow statement at the average rate. Translation differences arising on the translation of net assets and statements of financial performance are recognised in equity.

The table below shows the principal currencies and their exchange rates.

Currency	Closing rate as of		Average rate	
	31.12.2019	31.12.2018	2019	2018
1 EUR	1.0866	1.1265	1.1125	1.1549
1 USD	0.9676	0.9855	0.9937	0.9780
1 SGD	0.7190	0.7205	0.7284	0.7250

Revenue recognition

Each inflow of funds is assessed to determine whether it is an exchange transaction (IPSAS 9) or a non-exchange transaction (IPSAS 23).

In the case of an exchange transaction (IPSAS 9), the revenue is generally recognised when the goods are delivered or the services rendered. For project agreements, the service obligation not yet performed is allocated to liabilities. The revenue is billed and reported by reference to the stage of completion of the project, based on the costs incurred in the reporting period.

In the case of a non-exchange transaction (IPSAS 23), a distinction is made between whether or not there is a performance or repayment obligation. If there is such an obligation, the corresponding amount is recognised as a liability at inception of the agreement and released to surplus or deficit according to the stage of completion based on the resources consumed. If there is neither an exchange nor a performance or repayment obligation in accordance with IPSAS 23, revenue is recognised in surplus or deficit in full in the reporting period and net assets/equity increased accordingly. This is usually the case with donations.

Revenue is structured as follows:

Total federal contribution

The contributions granted by the Federal Government to the ETH Domain are allocated to the two Federal Institutes of Technology and the four research institutions for the purpose of fulfilling the strategic objectives set by the ETH Board. The federal financial contribution granted to ETH Zurich (global budget) comprises the expenditure credit to cover basic teaching and research equipment (financial contribution in the narrower sense) and the investment credit covering its share of building investments for the Federal Government-owned property used

by ETH Zurich. The investment credit is stated in the federal financial statements (Federal Office for Buildings and Logistics), while the total federal contribution in ETH Zurich's financial statements contains the federal financial contribution (in the narrower sense) and the federal contribution to accommodation. Both types of revenue are classified as non-exchange transactions (IPSAS 23). Federal contributions are recognised in the year in which they are paid.

The contribution to accommodation is equal to the accommodation expense, which is equal in amount to an imputed rent for the buildings owned by the Federal Government and used by ETH Zurich. Accommodation expense is reported within other operating expenses.

Tuition fees, continuing education

Revenue from tuition fees, contributions towards continuing and further education costs, and administration fees is classified as an exchange transaction (IPSAS 9). As a rule, revenue is accounted for on an accrual basis when the goods are delivered or the services rendered.

Research contributions, mandates and scientific services

Project-related contributions are given to ETH Zurich by various donors with the aim of promoting teaching and research. Project financing primarily relates to multi-year projects. Depending on the nature of the contributions, they are classified as either an exchange or a non-exchange transaction.

Donations and bequests

Revenue from donations and bequests is classified as a non-exchange transaction (IPSAS 23). Such grants where there is no conditional repayment risk are usually recognised as revenue in full when the agreement is signed.

Donations also include goods and services in-kind, which are distinguished as follows:

- Goods in-kind are recognised as assets in accordance with the applicable provisions when the agreement is signed.
- Donated rights to use assets in the sense of an operating lease are recognised as revenue and expense. Donated rights to use assets in the sense of a finance lease are measured at their fair value at inception of the agreement, if this is known, and depreciated over their useful life. If a performance obligation exists, it is stated as a liability and revenue recognised annually according to the services received. If there is no performance obligation, revenue is recognised upon recognition of the asset as a whole.
- Services in-kind received are not recognised, but are instead disclosed and commented upon in the notes if they are material.

Rights of use and services in-kind in connection with research agreements are not recognised due to the large number and the difficulty in recording, separating and measuring them. A general description of the research activity is merely provided in the notes to the consolidated financial statements.

Other revenue

Among other items, other revenue includes other service revenue and real estate revenue. This revenue is classified as an exchange transaction (IPSAS 9). As a rule, revenue is accounted for on an accrual basis when the goods are delivered or the services rendered.

Cash and cash equivalents

Cash and cash equivalents comprise cash-in-hand, demand and term deposits with financial institutions and funds invested with the Federal Government with an initial or remaining term of up to 90 days at the acquisition date. Cash and cash equivalents are measured at their nominal amount.

Receivables

Receivables from exchange (from goods and services) and non-exchange transactions are presented separately in the balance sheet.

In the case of receivables from non-exchange transactions (IPSAS 23), such as on SNSF and EU projects and from other donors, it is probable that there will be an inflow of funds in relation to the total contractual project volume. Therefore, the total amount of the project is usually recognised as a receivable at inception of the agreement if the fair value can be measured reliably. If the recognition criteria cannot be met, information is disclosed under contingent assets.

Non-current receivables of over CHF 10 million are stated at amortised cost using the effective interest method. Current receivables are stated at cost.

Value adjustments are recognised on receivables on the basis of experience and a case-by-case assessment.

Inventories

Inventories are measured at the lower of cost and net realisable value. Cost is calculated using the weighted average cost method. Appropriate value adjustments are recognised for slow-moving inventories.

Property, plant and equipment

Items of property, plant and equipment are stated at cost less accumulated depreciation. They are depreciated over their estimated useful life using the straight-line method. The estimated useful lives are as follows:

Asset category	Useful life
Immovable assets	
Property	unrestricted
Leasehold improvements ≤ CHF 1 million	10 years
Leasehold improvements > CHF 1 million	according to components
Buildings and structures	according to components ¹
Movable assets	
Machinery, equipment, tools, devices	5 years
Passenger vehicles, delivery vehicles, trucks, aircraft, ships, etc.	5 years
Furnishings	5 years
IT and communication	3 years

¹ Useful life depends on the type of building, its purpose and the fabric of the building (20 – 100 years). Assets under construction are not depreciated.

Capitalised leasehold improvements and installations in leased premises are depreciated over the estimated useful life or over the term of the lease if shorter.

In the event of additions to property, plant and equipment, it is checked whether components with a value that is significant in relation to the total value need to be recognised and depreciated separately because they have a different useful life (components approach).

Investments that have future economic benefits or service potential over several years and can be measured reliably are recognised as assets and depreciated over the estimated useful life.

The residual value of property, plant and equipment that is scrapped or sold is derecognised at the time of the asset's physical disposal. The gains or losses resulting from the derecognition of an item of property, plant and equipment are recognised as operating revenue or operating expenses.

Movable cultural items and works of art are not recognised as assets. An inventory of these items is kept.

Intangible assets

Intangible assets are recognised at cost. Standard software is amortised over three years using the straight-line method. Other intangible assets with an amortisation period required to be determined individually are amortised over their estimated useful life using the straight-line method.

Impairments (property, plant and equipment and intangible assets)

Property, plant and equipment and intangible assets are reviewed annually for indications of impairment. If specific indications are identified, an impairment test is performed. If the carrying amount permanently exceeds the value in use or net realisable value, an impairment is recognised in surplus or deficit in the amount of the difference.

Leases

Leases of property where ETH Zurich substantially assumes all the risks and rewards incidental to ownership are treated as finance leases. At inception of the lease, the assets and liabilities under a finance lease are recognised at the fair value of the leased property or, if lower, the present value of the minimum lease payments. Each lease payment is apportioned between the reduction of the outstanding liability and the finance charge. The reduction is deducted from the recognised lease liability. A leased asset is depreciated over its useful life or, if it is not reasonably certain that ownership will transfer at the end of the lease term, over the shorter contract term.

Other leases where ETH Zurich is the lessee are recognised as operating leases. They are not carried in the balance sheet, but instead recognised as an expense in the statement of financial performance on an accrual basis.

Financial assets and loans

Financial assets are recognised at fair value if they are acquired with the intention of generating a profit from short-term fluctuations in price or if they are designated as financial assets at fair value (e.g. investments held without significant influence). Changes in value are recognised in surplus or deficit.

Other non-current financial assets that are held for an indefinite period and may be sold at any time for liquidity reasons or in response to changes in market conditions are classified as available for sale and stated at fair value or at cost if the fair value cannot be determined reliably. Unrealised gains and losses are recognised in equity and only transferred to surplus or deficit when the financial asset is sold or an impairment occurs. For instance, investments where there is neither control nor significant influence are recognised as available for sale.

Originated loans and fixed deposits are stated either at amortised cost (nominal value of less than CHF 10 million and current loans and fixed deposits of over CHF 10 million) or at amortised cost using the effective interest method (non-current loans and fixed deposits of over CHF 10 million). The effective interest method allocates the difference between the acquisition cost and the repayment amount (premium/discount) over the term of the asset using the net present value method. Impairment losses are recognised based on a case-by-case assessment.

Derivative financial instruments are used primarily for hedging or as a strategic position. Without exception, they are measured at fair value. Changes in value are usually recognised in surplus or deficit.

Investment property

Investment property is only reported separately if it is material. Otherwise, it is recognised in the balance sheet as property, plant and equipment and disclosed accordingly.

Co-financing

Co-financing is third-party funding acquired by ETH Zurich that is used to finance construction projects in property owned by the Federal Government. Co-financing is measured based on the valuation of the underlying property, which the Federal Government recognises at cost less accumulated depreciation. A property's ongoing depreciation reduces the value of the co-financing to the same degree as the underlying property.

Co-financing is reported at the same amounts on both the assets and the equity and liabilities side (equity) of the balance sheet.

Current liabilities

Current liabilities are usually recognised on receipt of the invoice. This item also includes current accounts with third parties (including social insurance institutions). Current liabilities are measured at their nominal amount.

Financial liabilities

Financial liabilities include monetary liabilities arising from financing activities, as well as negative replacement values from derivative financial instruments. Monetary liabilities are usually interest-bearing. Liabilities that are due for repayment within twelve months of the reporting date are current. They are generally measured at amortised cost. Derivative financial instruments are measured at their fair value.

Provisions

Provisions are recognised when a past event gives rise to a present obligation, an outflow of resources is probable and the amount can be estimated reliably.

Net defined benefit liabilities

The net defined benefit liabilities presented in the balance sheet are measured in accordance with the methods under IPSAS 39. They correspond to the present value of the defined benefit obligations (DBO) less the fair value of the plan assets. The description of the pension scheme and the beneficiaries at ETH Zurich can be found in note 25.

The defined benefit obligations and service cost are determined annually by external experts using the projected unit credit (PUC) method. The calculation is made based on information about the beneficiaries (salary, vested benefits, etc.) and using both demographic variables (retirement rates, disability rates, mortality rates, etc.) and financial variables (salary or pension trends, returns, etc.). The amounts calculated are discounted to the valuation date by applying a discount rate. Changes in estimates of economic conditions can significantly affect defined benefit obligations.

The defined benefit obligations were measured based on the current membership base of the ETH Domain's pension scheme as of 31 October 2019, using actuarial assumptions as of 31 December 2019 (e.g. BVG 2015 actuarial tables) and the plan provisions of the ETH Domain pension scheme. The results were then adjusted using estimated pro rata cash flows as of 31 December 2019. The fair value of the plan assets was used, including estimated performance as of 31 December 2019.

Current service cost, past service cost resulting from plan amendments, gains and losses on settlement, administrative costs and interest on the net defined benefit liabilities are presented in the statement of financial performance within personnel expenses.

Plan amendments and plan settlements are recognised immediately in surplus or deficit in the period in which they occur provided they result in vested benefits. Actuarial and investment gains and losses on defined benefit plans are recognised directly in equity in the reporting period in which they occur.

Dedicated third-party funds

Liabilities from dedicated projects that arise from non-exchange transactions (IPSAS 23) are presented in the balance sheet as dedicated third-party funds. They are allocated solely to non-current liabilities because the projects usually last for several years and the current portion of the liability cannot be determined in most cases due to the nature of the projects.

They are measured based on the outstanding performance obligations at the reporting date, which are calculated from the total contractual project volume less services performed up to the reporting date.

Equity

Net assets/equity is the residual interest in the assets of an entity after deducting all its liabilities. Equity is structured as follows:

Valuation reserves (recognition in equity)

- Revaluation reserves for available-for-sale financial assets recognised at fair value: Fair value changes are recognised in equity until the financial assets are sold.
- Revaluation reserves for net defined benefit liabilities: Actuarial and investment gains and losses on defined benefit obligations or plan assets are recognised in equity.
- Valuation reserves from hedging transactions: If hedge accounting is used, positive and negative replacement values from hedging transactions are recognised in equity and released to surplus or deficit when the hedged transaction affects surplus or deficit.

Dedicated reserves

- Donations and bequests: This item includes unused funds from donations and bequests that have certain conditions attached, but are not required to be classified as liabilities.
- Teaching and research reserves: This item indicates that various internal and external commitments exist and appropriate reserves have been recognised to cover them. They comprise reserves for teaching and research projects as well as "election commitments", i.e. funds granted to newly elected professors under contractual arrangements for the purpose of setting up their professorship.
- Infrastructure and administration reserves: These include reserves for fluctuations in the value of the securities portfolio (risk capital) and for delayed construction projects.

Dedicated reserves must (with the exception of election/appointment commitments) have been generated. They are recognised and released within equity.

Free reserves

Unused funds for which there are no contractual or internal provisions in accordance with IPSASs are presented as free reserves. They are not restricted in terms of time or purpose.

Reserves from associated entities

This item comprises reserves from the inclusion of the share of equity of investments in associated entities that are accounted for using the equity method. These dedicated reserves cannot be accessed directly.

Accumulated surplus/deficit

The item "Accumulated surplus/deficit" shows the cumulative results at the reporting date. It comprises the surplus/deficit carried forward, the surplus/deficit for the period and increases/decreases in the reserves in equity.

The surplus/deficit carried forward is accumulated annually as part of the appropriation of surplus/deficit. The surplus/deficit for the period includes the portion of the result not yet distributed. If currency translation differences arise on foreign consolidated entities on consolidation, they are recognised in equity, without affecting surplus or deficit.

Contingent liabilities and contingent assets

A contingent liability is either a possible obligation that arises from past events and whose existence will be confirmed only by the occurrence or non-occurrence of an uncertain future event not wholly within the control of the entity or a present obligation that arises from past events, but is not recognised because of its low probability of occurrence (less than 50 percent) or because the obligation cannot be measured reliably, as a result of which the criteria for recognising a provision are not met.

A contingent asset is a possible asset that arises from past events and whose existence will be confirmed only by the occurrence or non-occurrence of an uncertain future event not wholly within the control of the entity.

Financial commitments

Financial commitments are presented in the notes if they are based on events prior to the reporting date, they will definitely lead to obligations to third parties after the reporting date and their amount can be measured reliably.

Cash flow statement

The cash flow statement shows the cash flows from operating activities, investing activities and financing activities. It is presented using the indirect method, i.e. cash flows from operating activities are based on the surplus or deficit for the period, adjusted for the effects of transactions of a non-cash nature. "Total cash flow" represents the change in the balance sheet item "Cash and cash equivalents".

Estimation uncertainty and management judgements

Estimation uncertainty in the application of accounting policies

Preparation of the annual consolidated financial statements depends on estimates and assumptions involved in applying the accounting policies, where management may exercise a certain degree of judgement. This applies to the following items in particular:

- **Useful life and impairment of property, plant and equipment:** The useful life of property, plant and equipment is defined and periodically reviewed bearing in mind the current technical environment and past experience. A change in the estimate may affect the future amount of the depreciation charges and the carrying amount. Estimates that could lead to a reduction in the carrying amount (impairment) are likewise made in the course of the regular impairment test.
- **Provisions:** These involve a high degree of estimation and therefore may lead to a higher or lower cash outflow depending on the actual outcome of a past event.
- **Net defined benefit liabilities:** The net defined benefit liabilities are calculated based on long-term actuarial assumptions for the defined benefit obligations and for the expected returns on plan assets. The discount rate and future salary trends are key components in the actuarial valuation. These assumptions may differ from actual future developments.
- **Recognition of donations:** ETH Zurich regularly receives donations in the form of assets. Under IPSASs, donations must be recognised initially at fair value. The determination of that fair value requires management to make estimates.
- **Discount rates:** Uniform discount rates have been defined within the ETH Domain for use in discounting non-current receivables, liabilities and provisions. They are based on a risk-free rate and a premium for credit risk.

Management judgements in the application of accounting policies

There were no particular or exceptional management judgements in the application of accounting policies that had a material effect on the annual consolidated financial statements in the reporting period or in the previous year.

4 Total federal contribution

The total federal contribution amounted to CHF 1,298 million in the reporting period (previous year: CHF 1,326 million). It comprises the federal financial contribution (in the narrower sense) or expenditure credit, which is used to cover basic teaching and research equipment, and the federal contribution to accommodation to cover rent charged by the Federal Government for the use of the buildings it owns. The latter is offset to an equal degree by the accommodation expense for the use of property owned by the Federal Government (see note 10).

The financial contribution declined by CHF 19 million, or 2 percent, to CHF 1,158 million in 2019. The contribution to accommodation, which comprises the depreciation charges on buildings and the return on asset value, fell by CHF 9 million to CHF 140 million. The main reasons for this were lower depreciation charges as a result of some buildings being written down in full and a lower return due to a reduction in interest rates.

5 Tuition fees, continuing education

This item of revenue primarily includes the tuition fees paid by students and doctoral candidates, various additional registration fees and fees for continuing education programmes.

Revenue from tuition fees and continuing education rose by CHF 4 million to CHF 28 million. The rise reflects the higher number of students, the moderate increase in tuition fees and the targeted expansion of the range of continuing education programmes on offer.

6 Research contributions, mandates and scientific services

CHF million	2019	of which revenues (IPSAS 23)	of which revenues (IPSAS 9)	2018	Change absolute
Swiss National Science Foundation (SNSF)	125	125	0	124	2
Swiss Innovation Agency (Innosuisse)	21	21	0	22	-1
Special federal funding of applied research	36	25	12	26	10
EU Framework Programmes for Research and Innovation (FP)	67	67	0	64	4
Industry-oriented research (private sector)	61	19	42	60	1
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)	46	32	13	42	4
Total research contributions, mandates and scientific services	357	290	66	337	20

Revenue from research contributions, mandates and scientific services mostly increased: federal research mandates (applied research) showed a rise in revenue (CHF +10 million) that reflected both the progress on ongoing projects and new projects. A further portion of the rise resulted from the fact that scientific services provided to third parties have been presented in the applied research category more consistently than was the case in previous years (see note 8). Revenue from other project-oriented third-party funding was also higher than in the previous year (CHF +4 million) due to the progress on ongoing projects, with the revenue contributed by entities controlled by ETH Zurich and included in the annual consolidated

financial statements remaining unchanged. Research contributions from EU Framework Programmes for Research and Innovation rose to CHF 67 million (CHF +4 million), of which CHF 9 million comprised federal contributions granted directly from federal funds as part of the bridge financing (Horizon 2020) (previous year: CHF 13 million).

Information on receivables from non-exchange transactions, changes in those receivables and dedicated third-party funds related to projects financed through the third-party funding category in question can be found in notes 14 and 26.

7 Donations and bequests

Revenue from donations and bequests amounted to CHF 64 million (CHF – 72 million). It resulted mostly from donation agreements signed in 2019. Such agreements are usually recognised in surplus or deficit in full in the year of signing and are mostly

subject to certain conditions. Also included in this item were goods and services in-kind outside research collaborations in the amount of CHF 1 million (CHF +1 million), mostly in the form of rights of use.

8 Other revenue

CHF million	2019	2018	Change absolute
Licences and patents	2	3	0
Sales	6	6	0
Refunds	4	4	1
Other services	14	14	0
Real estate revenue	7	5	1
Revenue from real estate owned by the Federal Government left for use	3	3	0
Profit from disposals (property, plant and equipment)	0	1	0
Other miscellaneous revenue	5	9	– 4
Total other revenue	42	44	– 2

Other revenue showed a fall (CHF – 2 million) due mainly to the decline in other miscellaneous revenue (CHF – 4 million). This reduction was partly attributable to the fact that scientific services provided to third parties have been presented as revenue

from research contributions, mandates and scientific services (see note 6) more consistently than was the case in previous years.

9 Personnel expenses

CHF million	2019	2018	Change absolute
Professors	129	127	3
Scientific personnel	464	453	12
Technical and administrative personnel, apprentices, trainees	352	335	17
IC, Suva and other refunds	-4	-5	0
Total salaries and wages	942	910	32
Social insurances OASI/DI/IC/MB	59	58	2
Net pension costs	149	147	2
Accident and sickness insurance Suva (BU/NBU/KTG)	3	3	0
Employer's contribution to Family Compensation Fund (FAK/FamZG)	11	10	0
Total social insurance schemes and pension expenses	222	218	4
Other employer contributions	0	0	0
Temporary personnel	0	0	0
Change in provisions for untaken leave and overtime	-1	4	-5
Change in provisions for contributions to long-service awards	2	-6	8
Other personnel expenses	6	6	0
Total personnel expenses	1,172	1,133	39

Salaries and wages increased by CHF 32 million, or 3 percent, year on year. This was related to the rise in average full-time equivalents by 317 FTEs to 9,845 FTEs (+3 percent). Details on the changes in personnel can be found in the Human Resources and Infrastructure section.

Net pension costs represent the net defined benefit liability accrued and allocated on a straight-line basis over the years of service.

The change in provisions for contributions to long-service awards (CHF 2 million) reflected actuarial losses, whereas the prior-year figure (CHF -6 million) was attributable to actuarial gains.

10 Other operating expenses

CHF million	2019	2018	Change absolute
Expenses for goods and materials	61	66	- 5
Premises costs	196	236	- 40
Energy costs	32	29	3
IT expenses	49	52	- 2
Expenses for consultations, expertises and guest lecturers	47	41	7
Library expenses	23	20	2
Other operating costs	88	92	- 5
Total other operating expenses	496	536	- 39

Expenses for goods and materials decreased (CHF -5 million) due, among other factors, to lower expenses for material goods, work in progress and finished products not recognised as assets, and for biological preparations and chemicals.

Premises costs, which also include expenses for leasehold improvements, decreased (CHF -40 million) despite an increase in construction activity on leasehold improvements. One of the main reasons was the sharp rise in the volume of

leasehold improvements capitalised following the change in capitalisation practice as of 1 January 2019 (see note 18). Accommodation expense for the use of property owned by the Federal Government also fell (CHF -9 million; see note 4).

The decrease in other operating costs (CHF -5 million) mainly reflected a reduction in expenditure on other services, communications and out-of-pocket expenses.

11 Transfer expenses

CHF million	2019	2018	Change absolute
Scholarships and grants to students and doctoral students	15	13	1
Contributions to research projects	5	3	2
Other transfer expenses	7	6	1
Total transfer expenses	27	23	4

The rise in transfer expenses (CHF +4 million) was partly the result of higher contributions to new research projects.

12 Net finance income/expense

CHF million	2019	2018	Change absolute
Finance income			
Interest income	5	6	-1
Income from investments	4	3	2
Changes in fair value of financial assets	30	1	28
Foreign currency gains	2	2	1
Other finance income	0	0	0
Total finance income	41	12	29
Finance expense			
Interest expense	1	1	0
Other financing costs for provision of capital	0	0	0
Changes in fair value of financial assets	1	16	-14
Foreign currency losses	5	3	2
Impairment of loans and fixed deposits	0	0	0
Other finance expense	1	1	0
Total finance expense	8	20	-12
Total net finance income/expense	33	-9	42

Net finance income was the result of the positive performance of the asset management mandates (see also note 19), which is reflected in "Changes in fair value of financial assets" on both the income and the expense side.

Interest income resulted mostly from unwinding of the discount on material receivables.

Interest expense primarily contained the interest on the finance lease. Further information on the finance lease can be found in note 22.

13 Cash and cash equivalents

CHF million	31.12.2019	31.12.2018	Change absolute
Cash	1	1	0
Swiss Post	43	58	- 14
Bank	23	24	- 1
Short-term deposits (<90 days)	100	100	0
Total cash and cash equivalents	168	183	- 15

The change in cash and cash equivalents is closely related to ETH Zurich's investing and financing activities (see "Consolidated cash flow statement"). A significant portion of "Cash and cash equivalents" comprises deposits with the Federal Government

(short-term deposits with an initial or remaining term of up to 90 days at the acquisition date).

There are no restrictions on the use of cash and cash equivalents.

14 Receivables

CHF million	31.12.2019	31.12.2018	Change absolute
Receivables from project contracts and donations	908	867	42
Other receivables	1	1	0
Value adjustments	0	0	0
Total receivables from non-exchange transactions	910	867	42
of which current	306	241	65
of which non-current	604	627	- 23
Trade accounts receivable	24	18	6
Other receivables	0	0	0
Value adjustments	0	- 1	0
Total receivables from exchange transactions	24	18	6
of which current	24	18	6
of which non-current	0	0	0

Receivables from non-exchange transactions reflect the total amount of contractual payments for mainly project-oriented research contributions which have not yet been transferred to ETH Zurich. Grants that have been promised but not yet transferred under donation agreements are also recognised as receivables from non-exchange transactions.

Receivables from SNSF projects saw the sharpest rise. Receivables for EU projects and applied research projects also increased. Conversely, there was a decrease in particular in receivables for Innosuisse projects and for projects financed out of other third-party funds.

Due dates of receivables

CHF million

	Total receivables	Not past due	Past due up to 90 days	Past due 91 to 180 days	Past due more than 180 days
31.12.2019					
Gross amount	934	910	13	6	6
Receivables from non-exchange transactions	910	890	9	5	5
Receivables from exchange transactions	24	19	4	1	0
Value adjustments	0	0	0	0	0
of which individually impaired	0	0	0	0	0
31.12.2018					
Gross amount	886	876	8	1	1
Receivables from non-exchange transactions	867	863	4	0	1
Receivables from exchange transactions	18	13	5	0	0
Value adjustments	-1	-1	0	0	0
of which individually impaired	0	0	0	0	0

Value adjustments on receivables

Value adjustments on receivables were small in amount (CHF -0.4 million) and related to receivables from exchange transactions.

15 Inventories

Inventories comprise purchased inventories (there are no self-produced inventories). They stood at CHF 6 million (previous year: CHF 5 million).

16 Prepaid expenses and accrued income

CHF million

	31.12.2019	31.12.2018	Change absolute
Interest	0	0	0
Prepaid expenses	16	25	-9
Other prepaid expenses and accrued income	6	2	4
Total prepaid expenses and accrued income	22	27	-5

This item consists mainly of the library's media purchases, advance rental payments and advance payments for hardware and software maintenance agreements.

17 Investments in associated entities and joint ventures

Details on material associated entities can be found in the section below. Further information on all associated entities is provided in note 32. ETH Zurich did not have any joint ventures in the reporting period.

Material associated entities and individually immaterial associated entities

Summarised financial information for each material associated entity and for the individually immaterial entities in aggregate is set out below. For the purposes of equity method accounting, the financial statements and the amounts reported there were adjusted, with some simplifications, to conform to the accounting of ETH Zurich.

CHF million

	ETH Zurich Foundation ¹	Student Housing Foundation ¹	Albert Lück Foundation ¹	Individually immaterial associated entities ²
31.12.2019				
Reporting date used	31.12.2019	31.12.2018	31.12.2018	31.12.2018
Current assets	330	5	1	7
Non-current assets	224	109	51	5
Short-term liabilities ³	1	1	7	0
Long-term liabilities ³	2	52	28	3
Revenue	118	13	6	1
Tax expense	0	0	0	0
Pre-tax gain or loss attributable to discontinued operations	0	0	0	0
Surplus (+) or deficit (-)	73	4	1	0
Dividends received from the associated entity	0	0	0	0
31.12.2018				
Reporting date used	31.12.2018	31.12.2017	31.12.2017	31.12.2017
Current assets	264	4	1	8
Non-current assets	226	107	53	5
Short-term liabilities ³	0	0	5	0
Long-term liabilities ³	2	54	33	3
Revenue	131	11	6	0
Tax expense	0	0	0	0
Pre-tax gain or loss attributable to discontinued operations	0	0	0	0
Surplus (+) or deficit (-)	-12	2	1	0
Dividends received from the associated entity	0	0	0	0

1 Material associated entity.

2 Individually immaterial associated entities include: Archives of Contemporary History Foundation and Foundation for Contemporary Jewish History.

3 For the consolidated financial statements of ETH Zurich, capital in the form of dedicated funds and liabilities arising from grants are eliminated from the liability line items of the ETH Zurich Foundation, as they are already included in ETH Zurich's equity, where they make up a significant portion of dedicated donation and bequest reserves.

The "Investments in associated entities and joint ventures" and "Reserves from associated entities" items presented in the consolidated balance sheet rose from CHF 93 million to CHF 168 million. The change reflects the share of surplus of associated entities in the reporting period (CHF 75 million), in particular a legacy for the ETH Zurich Foundation and net finance income posted by the ETH Zurich Foundation.

Unrecognised share of losses of associated entities

There was no unrecognised share of losses of associated entities, either for the reporting period or cumulatively.

18 Property, plant and equipment and intangible assets

	Machinery, equipment, furnishings, vehicles	Information and communication	Advance payments, movable assets under construction	Total movable assets	Property, buildings ¹	Assets under construction	Total immovable assets	Total property, plant and equipment	Total intangible assets ²
CHF million									
2019									
Purchase value									
As of 1.1.2019	857	231	12	1,099	271	62	333	1,433	11
Additions	48	17	4	69	7	68	75	144	1
Reclassifications	3	0	-3	0	13	-13	0	0	0
Disposals	-15	-8	0	-23	-5	0	-5	-27	0
As of 31.12.2019	893	240	13	1,145	286	117	404	1,549	11
Accumulated depreciation									
As of 1.1.2019	718	183	0	901	91	0	91	992	6
Depreciation	50	32	0	82	24	0	24	106	1
Impairments	0	0	0	0	0	0	0	0	0
Reversed impairments	0	0	0	0	0	0	0	0	0
Reclassifications	0	0	0	0	0	0	0	0	0
Disposals value adjustments	-15	-8	0	-22	-4	0	-4	-26	0
As of 31.12.2019	753	208	0	961	112	0	112	1,072	8
Balance sheet value as of 31.12.2019	140	32	13	185	175	117	292	477	4
thereof leased assets					15		15	15	
2018									
Purchase value									
As of 1.1.2018	841	231	16	1,088	281	44	326	1,414	9
Additions	53	18	3	74	0	25	25	99	3
Reclassifications	8	0	-8	0	7	-7	0	0	0
Disposals	-45	-19	0	-63	-18	0	-18	-81	-1
As of 31.12.2018	857	231	12	1,099	271	62	333	1,433	11
Accumulated depreciation									
As of 1.1.2018	713	172	0	885	82	0	82	968	6
Depreciation	48	30	0	79	23	0	23	102	1
Impairments	0	0	0	0	0	0	0	0	0
Reversed impairments	0	0	0	0	0	0	0	0	0
Reclassifications	0	0	0	0	0	0	0	0	0
Disposals value adjustments	-44	-19	0	-63	-15	0	-15	-78	-1
As of 31.12.2018	718	183	0	901	91	0	91	992	6
Balance sheet value as of 31.12.2018	139	47	12	198	180	62	243	441	5
thereof leased assets					15		15	15	

1 The Rübel Geobotanical Research Institution Foundation, an entity controlled by ETH Zurich, holds an investment property. It is not disclosed separately on materiality grounds.

2 Intangible assets comprise software and intangible assets in the implementation phase.

Movable items of property, plant and equipment consist largely of technical/scientific equipment and information and communications technology (ICT) equipment.

ETH Zurich's immovable property, plant and equipment consists of five properties (CHF 18 million), one property under a finance lease (CHF 15 million) and leasehold improvements (CHF 142 million excluding assets under construction of CHF 117 million). Leasehold improvements are user-specific

structural adjustments to buildings taken by ETH Zurich. The volume of leasehold improvements capitalised showed a sharp rise year on year (additions) due mainly to the change in capitalisation practice as of 1 January 2019 and an increase in construction activity.

The majority of the properties used by ETH Zurich are owned by the Federal Government and are reported in the balance sheet of the Federal Government rather than that of ETH Zurich.

19 Financial assets and loans

CHF million	31.12.2019	31.12.2018	Change absolute
Securities, fixed deposits and investment funds ¹	268	182	86
Positive replacement values	0	0	0
Other financial assets	795	829	-34
Loans	0	0	0
Total current financial assets and loans	1,063	1,011	52
Securities, fixed deposits and investment funds ¹	0	0	0
Other financial assets	4	3	1
Loans	1	1	0
Total non-current financial assets and loans	5	4	1

¹ In 2019, real estate funds were for the first time presented within "Securities, fixed deposits and investment funds". In the comparative period and in the prior-year report, they were included in "Other financial assets".

Current financial assets are obtained in particular by investing funds collected from third parties that will not be used immediately. Based on the applicable treasury agreement and the investment guidelines stipulated by the ETH Board, these funds are placed in the market or with the Federal Government. The third-party funds placed in the market are managed by Swiss banks under asset management mandates.

In 2019, a new, sustainable asset management mandate was opened. This addition and the positive performance from the existing asset management mandates led to a rise in current financial assets and loans (CHF +52 million).

Other non-current financial assets include investments held by ETH Zurich in spin-offs where it has an interest of less than 20 percent.

Loan funding granted to students and doctoral candidates on preferential terms amounted to CHF 0.5 million (of which CHF 0.4 million comprised current loans). Loans to students and doctoral candidates are repayable within twelve months (current) or in instalments over a period of six years from the individual completing their studies (non-current). There were no material loans past due or impairment losses on loans as of 31 December 2019.

20 Co-financing

CHF million	2019	2018	Change absolute
Purchase value			
As of 1.1.	62	62	0
Additions	0	0	0
Disposals	0	0	0
As of 31.12.	62	62	0
Accumulated depreciation			
As of 1.1.	14	12	2
Depreciation	2	2	0
Disposals	0	0	0
As of 31.12.	16	14	2
Balance sheet value as of 31.12.	47	48	-2

21 Current liabilities

CHF million	31.12.2019	31.12.2018	Change absolute
Trade payables	7	0	7
Liabilities to social insurance institutions	19	15	4
Other current liabilities	42	45	-3
Total current liabilities	68	60	8

The balance rose in 2019 because, in the previous year, all trade payables were paid as of the end of 2018 due to an SAP system migration.

22 Financial liabilities

Current and non-current financial liabilities

As in the previous year, non-current financial liabilities amounted to CHF 19 million and consisted primarily of liabilities under the finance lease (CHF 16 million). The slight reduction here was primarily the result of a reclassification into current financial liabilities and was a non-cash change.

As at the previous year-end, current financial liabilities were small in amount at the end of 2019. The change here due to repayments was a cash change.

Finance lease disclosures

CHF million	Future minimum leasing payments	Future financial expenses	Present value of future minimum leasing payments
	2019	2019	2019
Due dates			
Due within 1 year	1	1	0
Due within 1 to 5 years	6	4	1
Due after more than 5 years	29	14	15
Total as of 31.12.	36	19	16
Leasing expenses		2019	
Lease payments expensed in period		0	
Additional details			
Future revenue from sublease (from non-cancellable contracts)		0	

The only finance lease is for a property on the Höggerberg campus.

23 Accrued expenses and deferred income

CHF million	31.12.2019	31.12.2018	Change absolute
Interest	0	0	0
Deferred income	57	53	4
Other accrued expenses and deferred income	17	23	- 6
Total accrued expenses and deferred income	74	75	- 2

This item consists mainly of deferred income from exchange transactions and accrued expenses for central procurement, operations and construction projects.

24 Provisions

CHF million	Provisions for untaken leave and overtime	Other long-term employee benefits (IPSAS 39)	Other provisions	Total provisions
2019				
As of 1.1.2019	48	28	1	77
Creation (incl. increase)	0	6	0	6
Reversal	-1	0	0	-1
Appropriation	0	-3	0	-3
Reclassifications	0	0	0	0
Increase in present value	0	0	0	0
As of 31.12.2019	48	31	0	78
of which short-term	48		0	48
of which long-term		31		31
2018				
As of 1.1.2018	44	34	0	78
Creation (incl. increase)	4	0	1	5
Reversal	0	-2	0	-2
Appropriation	0	-3	0	-3
Reclassifications	0	0	0	0
Increase in present value	0	0	0	0
As of 31.12.2018	48	28	1	77
of which short-term	48		1	49
of which long-term		28		28

Provisions for untaken leave and overtime (CHF 48 million) were unchanged year on year. Provisions for other long-term employee benefits in accordance with IPSAS 39 increased (CHF +3 million). The rise was the result of actuarial losses due to the reduction in the discount rate (see note 25).

A provision recognised for an insured event in the previous year was reversed in the reporting period. There were no further provisions for dismantling, litigation, guarantees, warranties or other items in the reporting period or in the previous year.

25 Net defined benefit liabilities

Most ETH Zurich employees and pensioners are insured under the pension scheme the ETH Domain maintains at the collective institution "Swiss Federal Pension Fund PUBLICA" (PUBLICA). There are no other pension schemes at the controlled entities, which is why the further statements in the text refer to the pension scheme the ETH Domain maintains at PUBLICA.

Legal framework and responsibilities

Legal requirements

Swiss pension plans must be run through a legally separate, trustee-administered pension institution. The law prescribes minimum benefits.

Organisation of the pension scheme

PUBLICA is an independent, state-run institution under public law.

The Board of Directors (Kassenkommission) is PUBLICA's most senior governing body. In addition to management, it is also responsible for the oversight and supervision of PUBLICA's Executive Board. The Board of Directors has 16 members, eight representing the insured members and eight representing the employers from among all the affiliated pension plans. This means that PUBLICA's most senior governing body is made up of an equal number of employer and employee representatives.

Each pension scheme has its own governing body made up of equal numbers of representatives. Among other things, it is involved in concluding the affiliation contract and decides on the appropriation of any surpluses. Each governing body is made up of nine employer representatives and nine employee representatives from the entities.

Insurance plan

In accordance with IPSAS 39, insurance plans are classified as defined benefit plans.

The pension plan is defined in the terms of the ETH Domain pension scheme applicable to employees and professors. Those terms form part of the affiliation contract with PUBLICA. The pension plan provides benefits in excess of the minimum benefits required by law in the event of disability, death, old age and departure; i.e. it is what is known as an "enveloping" plan (obligatory and extraordinary benefits).

The employer and employee savings contributions are set as a percentage of the insured salary. A risk premium is charged for death and disability insurance. The administrative costs are paid by the employer.

The old-age pension is calculated from the credit balance in the retirement fund at the retirement date multiplied by the conversion rate specified in the terms. Employees have the option of drawing the retirement benefits as a lump sum. There are pension plans for different groups of insured persons. In addition, employees have the option of making additional savings contributions.

The risk benefits are determined depending on the projected savings capital, which attracts interest, and on the conversion rate.

Investment of assets

Investments are made by PUBLICA for all pension schemes (with the same investment profile) collectively.

As PUBLICA's most senior governing body, the Board of Directors bears overall responsibility for asset management. It is responsible for issuing and amending the investment policy and determines the investment strategy. The Investment Committee advises the Board of Directors on investment-related issues and oversees compliance with the investment policy and strategy.

Responsibility for implementing the investment strategy rests with PUBLICA's Asset Management. Asset Management also makes tactical decisions to deviate temporarily from the investment strategy weightings in order to generate added value compared to the existing strategy. Where individual asset classes are built up or reduced over a number of years, a pro rata strategy is calculated so as to enable transactions to be spread over time.

Risks for the employer

The governing body of the ETH Domain's pension scheme made up of equal numbers of representatives can change the funding system (contributions and future benefits) at any time. The governing body may collect restructuring contributions from the employer while the scheme is underfunded within the meaning of pension law (Article 44 Occupational Pension Ordinance BVV 2) and if other measures are without success. If these are used to fund benefits in excess of the statutory minimum, the employer must indicate their agreement with this.

The definitive funding ratio in accordance with the Occupational Pensions Act (BVG) was not yet available at the time the annual consolidated financial statements were authorised for issue. The provisional regulatory funding ratio for the ETH Domain's pension scheme at PUBLICA, in accordance with the Occupational Pension Ordinance (BVV 2), was 105.7 percent at the end of the year (2018: 101.8 percent, definitive). The provisional economic funding ratio for the ETH Domain's pension scheme at PUBLICA was 87.2 percent at the end of the year (2018: 84.7 percent, definitive).

Special events

There were no plan amendments, plan curtailments or plan settlements required to be reflected in the current reporting period.

Net defined benefit liabilities

CHF million	31.12.2019	31.12.2018	Change absolute
Present value of defined benefit obligations	-4,704	-4,318	-386
Fair value of plan assets	3,559	3,262	297
Recognised net defined benefit liabilities	-1,145	-1,056	-89

The increase in net defined benefit liabilities was primarily attributable to the reduction in the discount rate (2019: -0.2 percent; 2018: 0.3 percent), which was offset to a large extent by the positive performance from the plan assets.

Net pension costs

CHF million	2019	2018	Change absolute
Current service cost (employer)	140	142	-2
Past service cost	6	5	1
Gains (-)/losses (+) from plan settlements	0	0	0
Interest expense from defined benefit obligations	13	13	0
Interest income from plan assets	-10	-10	0
Administrative costs (excl. asset management costs)	2	2	0
Other	0	0	0
Total net pension costs incl. interest expense recognised in statement of financial performance	151	151	-1

Net pension costs were unchanged year on year.

In the reporting period, the ETH Board made contributions of CHF 3.5 million to the ETH Domain's pension scheme. For ETH Zurich, this amount was reflected in the actuarial valuation as a pro rata employer contribution (CHF 1.7 million). The share of the contribution led to a difference compared with the net

pension costs actually recognised (see note 9), as this contribution was not charged on to ETH Zurich.

Employer contributions of CHF 107.6 million and employee contributions of CHF 58.9 million are expected for the coming financial year.

Revaluation recognised in equity

CHF million	31.12.2019	31.12.2018	Change absolute
Actuarial gains (-)/losses (+)	348	8	340
from change in financial assumptions	313	- 19	331
from change in demographic assumptions	0	- 18	18
from experience adjustments	36	45	- 9
Return on plan assets (excl. interest income), (gains [-]/losses [+])	- 298	115	- 413
Other	0	0	0
Revaluation recognised in equity	50	123	- 73
Cumulative amount of revaluation recognised in equity (gain [-]/loss [+])	702	652	50

An actuarial revaluation loss of CHF 50 million was recognised in equity in the reporting period (2018: revaluation loss of CHF 123 million). This resulted in a total cumulative loss of CHF 702 million as of 31 December 2019 (2018: CHF 652 million). The actuarial losses attributable to the change in financial

assumptions were the result of the reduction in the discount rate and were mitigated slightly by the lower return on retirement savings. The return on plan assets (gain) recognised in equity was due to the higher-than-expected positive return of over 9 percent that was achieved (discount rate of 0.3 percent).

Change in the present value of defined benefit obligations

CHF million	2019	2018	Change absolute
Present value of defined benefit obligations as of 1.1.	4,318	4,265	53
Current service cost (employer)	140	142	- 2
Interest expense from defined benefit obligations	13	13	0
Employee contributions	61	56	5
Benefits paid in (+) and paid out (-)	- 181	- 170	- 11
Past service cost	6	5	1
Gains (-)/losses (+) from plan settlements	0	0	0
Actuarial gains (-)/losses (+)	348	8	340
Other	0	0	0
Present value of defined benefit obligations as of 31.12.	4,704	4,318	386

The weighted average duration of the defined benefit obligations was 15.5 years as of 31 December 2019 (previous year: 14.7 years).

Change in the fair value of plan assets

CHF million	2019	2018	Change absolute
Fair value of plan assets as of 1.1.	3,262	3,372	- 111
Interest income from plan assets	10	10	0
Employer contributions	112	111	1
Employee contributions	61	56	5
Benefits paid in (+) and paid out (-)	- 181	- 170	- 11
Gains (+)/losses (-) from plan settlements	0	0	0
Administrative costs (excl. asset management costs)	- 2	- 2	0
Return on plan assets (excl. interest income), (gains [+]/losses [-])	298	- 115	413
Other	0	0	0
Fair value of plan assets as of 31.12.	3,559	3,262	297

Reconciliation of net defined benefit liabilities

CHF million	2019	2018	Change absolute
Net defined benefit liabilities per 1.1.	- 1,056	- 893	- 164
Net pension costs incl. interest expense recognised in statement of financial performance	- 151	- 151	1
Revaluation recognised in equity	- 50	- 123	73
Employer contributions	112	111	1
Obligations paid directly by the entity	0	0	0
Other	0	0	0
Net defined benefit liabilities per 31.12.	- 1,145	- 1,056	- 89

Major categories of plan assets

In %	31.12.2019	Listed	Not listed	31.12.2018	Listed	Not listed
Liquidity	6	5	0	2	3	0
Bonds (in CHF) Confederation	5	6	0	6	7	0
Bonds (in CHF) excl. Confederation	10	12	0	12	13	0
Government bonds (in foreign currencies)	26	29	0	26	28	0
Corporate bonds (in foreign currencies)	11	12	0	14	15	0
Mortgages	0	0	0	0	0	0
Shares	27	30	0	28	31	0
Real estate	8	3	53	7	1	65
Commodities	2	3	0	2	2	0
Other	5	0	47	3	0	35
Total plan assets	100	100	100	100	100	100

PUBLICA bears the actuarial and investment risks itself. The investment strategy is defined in such a way that benefits under the policy can be provided at maturity.

There is no known pension plan property used by the employer.

Principal actuarial assumptions used as at the reporting date

In %	2019	2018	Change absolute
Discount rate per 1.1.	0.30	0.30	0.00
Discount rate per 31.12.	-0.20	0.30	-0.50
Expected salary development	0.50	0.50	0.00
Expected pension development	0.00	0.00	0.00
Interest on retirement savings	0.00	0.30	-0.30
Life expectancy at age 65 – women (no. of years)	24.65	24.54	0.11
Life expectancy at age 65 – men (no. of years)	22.61	22.50	0.11

The discount rate is based on the spot interest rates for federal bonds published by the Swiss National Bank on a monthly basis and the expected cash flows of the ETH Domain's pension scheme at PUBLICA in accordance with existing prior-year data. The expected future rate of salary increase is based on

reference economic variables. The rate of pension increase is the rate of pension increase expected for the average remaining term based on the financial position of the pension plan. The generation tables in BVG 2015 are applied for assumptions about life expectancy.

Sensitivity analysis (effect on present value of defined benefit obligations)

CHF million	Increase in assumption 2019	Decrease in assumption 2019	Increase in assumption 2018	Decrease in assumption 2018
Discount rate (change +/- 0.25 %)	-176	189	-153	164
Expected salary development (change +/- 0.25 %)	20	-19	16	-16
Expected pension development (change +/- 0.25 %)	145	n.a.	127	n.a.
Interest on retirement savings (change +/- 0.25 %)	29	n.a.	26	-25
Life expectancy (change +/- 1 year)	177	-178	151	-153

The sensitivity analysis determined the change in the defined benefit obligations in the event of a change in actuarial assumptions. In each case, only one of the assumptions was adjusted, while the other inputs remained unchanged.

The discount rate and the assumptions about salary trends were increased or reduced by fixed percentage points. The

assumptions about pension trends and the return on retirement savings were increased, not reduced, for the reporting period, as it is not possible to curtail pension benefits or the return on retirement savings. The sensitivity to life expectancy was calculated by reducing or increasing life expectancy by a flat rate, as a result of which the life expectancy of most age categories was increased or reduced by about one year.

26 Dedicated third-party funds

CHF million	31.12.2019	31.12.2018	Change absolute
Swiss National Science Foundation (SNSF)	327	276	52
Swiss Innovation Agency (Innosuisse)	27	36	-9
EU Framework Programmes for Research and Innovation (FP)	223	209	14
Special federal funding of applied research	26	28	-2
Industry-oriented research (private sector)	33	38	-5
Other project-oriented third-party funding	31	29	2
Donations and bequests	110	111	-1
Total dedicated third-party funds	776	726	50

An increase in dedicated third-party funds was recorded mainly on SNSF projects (CHF +52 million) and EU projects (CHF +14 million) due to the growth in project volumes (primarily as a result of ERC grants).

The main items on a downward trajectory, on the other hand, were dedicated third-party funds for Innosuisse projects (CHF -9 million) and industry-oriented research projects (CHF -5 million). The reduction related mostly to the stage of completion of existing projects.

27 Financial risk management and additional information about financial instruments

General

Financial risk management is embedded in ETH Zurich's general risk management, in respect of which annual reports are made to the ETH Board (see the Governance and Sustainability section).

Financial risk management primarily addresses credit and default risk, liquidity risk and market risk (interest rate, foreign currency and other price risk).

The focus of risk management remains on credit risk. There are guidelines governing the investment of financial resources in order to reduce credit and market risk. The counterparties to

a large proportion of the receivables and claims arising from financial assets are of high credit standing and solvency. Risk concentrations only exist in respect of those counterparties, which is why credit risk is regarded as low.

Furthermore, there are receivables and financial assets in foreign currencies which are hedged according to prevailing circumstances in order to minimise the risk.

Compliance with and the effectiveness of the guidelines are ensured by the internal control system (ICS) (see the Governance and Sustainability section).

Credit and default risk

Maximum exposure to credit risk, breakdown by counterparty

CHF million	Total	Federal Government	European Commission FP ¹	SNSF, Innosuisse, OASI social service, Suva	SNB and banks with government guarantee	PostFinance and other banks	Other counterparties
31.12.2019							
Cash and cash equivalents	168	101	0	0	15	52	0
Receivables from non-exchange transactions	910	46	182	250	0	0	432
Receivables from exchange transactions	24	5	0	0	0	0	18
Financial assets and loans	1,068	795	0	0	0	10	263
Prepaid expenses and accrued income	6	0	0	0	0	0	6
Total	2,176	947	182	250	15	62	720
Total prior period	2,085	943	176	231	15	76	643

¹ The remaining receivables due from the Federal Government (State Secretariat for Education, Research and Innovation [SERI]) under the Horizon 2020 bridge financing programme and the receivables from European universities arising from EU Framework Programmes for Research and Innovation are shown in the column "European Commission FP".

The maximum exposure to credit risk corresponds to the carrying amounts in the balance sheet. The actual risk is low due to the fact that the counterparties to a large proportion of the

financial assets are the Federal Government and other public-sector institutions.

Liquidity risk

ETH Zurich has processes and principles in place which guarantee that adequate liquidity is available to settle current and future obligations. These include systematic liquidity planning, monitoring and optimisation as well as maintaining an adequate reserve of liquidity and tradable securities.

The following table shows the contractual maturities of the financial liabilities:

CHF million	Total carrying amount	Total contract value	Up to 1 year	1–5 years	More than 5 years
31.12.2019					
Non-derivative financial liabilities					
Current liabilities	68	68	68	0	0
Leasing liabilities	16	36	1	6	29
Financial liabilities	3	3	0	0	3
Accrued expenses and deferred income	17	17	17	0	0
Derivative financial liabilities	0	0	0	0	0
Total	104	124	86	6	32
Total prior period	102	123	84	6	33

Financial liabilities arise, most notably, from current operating liabilities. Under normal circumstances, expenses and investments are financed with self-generated funds. In some cases, investments are financed through lease agreements.

All financial liabilities are covered by liquidity and by short-term deposits with the Federal Government. Liquidity risk is low.

Market risk

Interest rate and price risk

Interest rate risk is not hedged. A one percentage point increase or decrease in the interest rate would increase or reduce surplus or deficit by around CHF 9 million.

The bonds under the asset management mandates are also taken into account in analysing interest rate risk. The other trading positions (excluding bonds) largely consist of equity funds holding both international and Swiss equities. A ten-per-cent decrease in price would have a negative impact on surplus or deficit of CHF 25 million.

All trading positions exposed to price risk are held under asset management mandates with Swiss banks. There is a model in place for selecting the optimal portfolio for the investment strategy of the asset management mandates. This model is used to reconcile the risk associated with the assets and ETH Zurich's risk tolerance, and a reserve for fluctuations in value is recognised accordingly.

Foreign currency risk

Most foreign currency receivables are in euros and US dollars; they are hedged using derivative financial instruments according to prevailing circumstances. Most foreign currency risks

in asset management mandates are hedged. Net of hedges, a fluctuation in the exchange rate of the currencies of +/- 10 percent would impact on the statement of financial performance as follows:

CHF million	Total	CHF	EUR	USD	Other
31.12.2019					
Net currency balance	1,866	1,828	6	4	28
Sensitivity affecting financial performance +/- 10 %			1	0	3
Closing rate			1.0866	0.9676	
31.12.2018					
Net currency balance	1,793	1,765	9	5	15
Sensitivity affecting financial performance +/- 10 %			1	0	2
Closing rate			1.1265	0.9855	

The net currency balance for the EUR and USD categories related primarily to receivables from exchange transactions. The net currency balance for other currencies was CHF 28 million and related primarily to asset management mandates and the entity in Singapore controlled and consolidated by ETH Zurich. The year-on-year increase (CHF +14 million) was primarily attributable to the change in current financial assets (see note 19).

Capital management

Managed capital is defined as equity excluding valuation reserves. ETH Zurich seeks to create a solid equity base. This base will enable the implementation of the performance mandate to be guaranteed. Legal regulations prohibit ETH Zurich from raising funds on the capital market.

The entities controlled by ETH Zurich may raise funds on the capital market.

Estimation of fair value

Because of their short-term maturity, the carrying amount of cash and cash equivalents and the carrying amounts of current

loans, fixed deposits, receivables and current liabilities are a reasonable approximation of fair value.

The fair value of non-current receivables from non-exchange transactions and non-current loans is calculated based on the payments falling due in the future, which are discounted at market interest rates.

The fair value of available-for-sale financial assets is based on actual values, provided they can be determined reliably, or reflects their cost.

The fair value of fixed-rate financial liabilities which are not traded publicly is estimated on the basis of payments falling due in the future, which are discounted at market interest rates.

The fair value of publicly traded fixed-rate financial assets and liabilities is based on quoted prices at the reporting date.

The fair value of finance lease liabilities is calculated on the basis of payments falling due in the future, which are discounted at market interest rates.

Classes and categories of financial instruments, by carrying amount and fair value

CHF million	Total fair value	Total carrying amount	Loans and receivables	At fair value through surplus or deficit	Available for sale	Financial liabilities measured at amortised cost
31.12.2019						
Cash and cash equivalents	168	168	168			
Receivables from non-exchange transactions	910	910	910			
Receivables from exchange transactions	24	24	24			
Financial assets and loans	1,068	1,068	796	268	4	
Prepaid expenses and accrued income	6	6	6			
Financial liabilities ¹	104	104		0		104
31.12.2018						
Financial assets (in a broader sense) ²	2,085	2,085	1,866	216	3	
Financial liabilities ¹	102	102		0		102

¹ Current liabilities, leasing liabilities, financial liabilities, accrued expenses and deferred income (see the table in the section "Liquidity risk").

² Cash and cash equivalents, receivables from non-exchange transactions, receivables from exchange transactions, financial assets and loans, prepaid expenses and accrued income.

ETH Zurich does not hold any held-to-maturity financial assets.

Fair value hierarchy

Financial instruments measured at fair value are required to be disclosed within a three-level valuation hierarchy:

- Level 1: quoted prices in an active market for identical assets or liabilities;
- Level 2: valuation techniques where all significant inputs are based on observable market data;
- Level 3: valuation techniques where significant inputs are not based on observable market data.

CHF million	Carrying amount/ fair value	Level 1	Level 2	Level 3
31.12.2019				
Financial assets	272	268	0	4
Financial liabilities	0	0	0	0
31.12.2018				
Financial assets	219	216	0	3
Financial liabilities	0	0	0	0

Net surplus or deficit by category

CHF million

	Loans and receivables	At fair value through sur- plus or deficit	Available for sale	Financial liabilities
2019				
Interest income (+)/interest expense (–)	4	0		– 1
Income from investments		4	0	
Change in fair value		28		
Currency translation differences, net	– 2	0		0
Impairments	0		0	
Reversal of impairment	0			
Gains and losses reclassified from equity to the statement of financial performance			1	
Net surplus or deficit recorded in the statement of financial performance	2	32	1	– 1
Net surplus or deficit recognised in equity			2	
Total net surplus or deficit by category	2	32	3	– 1
2018				
Total net surplus or deficit by category	4	– 10	0	– 1

Fair value changes (CHF 28 million) had the biggest impact on net surplus or deficit (see note 12).

28 Contingent liabilities and contingent assets

Contingent liabilities

There were no contingent liabilities at the end of 2019 (previous year: CHF 0.2 million).

Contingent assets

There were no quantifiable contingent assets at the end of 2019 (previous year: CHF 2 million).

Aside from that, ETH Zurich receives research funds and grants from third parties where, although they meet the

significant characteristics of an asset, ETH Zurich's share of the future cash inflow could not be quantified reliably in the reporting period. These comprise the donation from Hansjörg Wyss for the Wyss Translational Center Zurich and the remaining inheritance from Dr Branco Weiss for the Society in Science programme (The Branco Weiss Fellowship) to support young researchers.

There was a further non-quantifiable contingent asset as a result of an insurance claim in connection with a loss event.

29 Financial commitments

CHF million

	31.12.2019	31.12.2018	Change absolute
Financial commitments up to 1 year	13	4	9
Financial commitments from 1 to 5 years	0	0	0
Financial commitments > 5 years	0	0	0
No due date / indefinite	0	0	0
Total financial commitments	13	4	9

At the end of 2019, there were financial commitments relating to the purchase of technical/scientific equipment amounting to CHF 13 million.

30 Operating leases

CHF million	2019	2018	Change absolute
Due dates			
Due within 1 year	32	22	9
Due within 1 to 5 years	89	56	32
Due after more than 5 years	95	49	46
Future minimum payments for non-cancellable operating lease as of 31.12.	215	127	88
Leasing expenses			
Minimum lease payments	25	23	2
Payments from subleasing	1	1	0
Leasing payments of current period	26	25	1
Additional details			
Future revenue from sublease (from non-cancellable contracts)	2	1	1

Operating leases relate mainly to rental agreements and to a lesser extent to IT licences. The rise in future minimum lease payments (CHF +88 million) related to new lease contracts due to an increase in the amount of space required.

31 Remuneration of key management personnel

The key management personnel of ETH Zurich are the five members of the Executive Board. The remuneration is disclosed in the section entitled Governance and Sustainability.

32 Relationships with controlled and associated entities

Controlled entities

The entities listed below were consolidated.

	Legal form	Nature of collaboration/ business activity	Domicile	Currency	Jurisdiction	Proportion of voting rights and participating share (in %) ²		Reporting date used
						31.12.2019		
ETH Singapore SEC Ltd.	Ltd.	Strengthening the global position of Switzerland and Singapore in the field of environmental sustainability and engaging in appropriate research collaborations.	Singapore	SGD	Singapore	100	100	31.03.2019
Rübel Geobotanical Research Institute Foundation ¹	Foundation	Promoting geobotanical science (plant sociology, plant ecology, plant distribution, vegetation history).	Zurich	CHF	Switzerland	57	100	31.12.2018

¹ The remaining 43 percent of the voting rights in the foundation are held by people determined by the founder. However, ETH Zurich has a 100-percent equity interest in the foundation.

² As in the previous year.

Summarised financial information on the two controlled entities is set out in the table below:

CHF million	31.12.2019	of which ETH Singapore SEC Ltd.	of which Rübel Geobotanical Research Institute Foundation	31.12.2018
Current assets	12	9	3	11
Non-current assets	3	1	3	3
Short-term liabilities	1	1	0	0
Long-term liabilities	11	8	3	10
Revenue	16	16	0	16
Surplus (+) or deficit (-)	0	0	0	0

Associated entities

All the associated entities listed were accounted for using the equity method.

	Legal form	Nature of collaboration/ business activity	Domicile	Currency	Jurisdiction	Proportion of voting rights and participating share (in %) ²	
						31.12.2019	
Material associated entities							
ETH Zurich Foundation ¹	Foundation	Promoting teaching and research at the Swiss Federal Institute of Technology Zurich.	Zurich	CHF	Switzerland	15	100
Student Housing Foundation	Foundation	Providing and operating low-cost housing for students in Zurich.	Zurich	CHF	Switzerland	22	50
Albert Lück Foundation	Foundation	Promoting teaching, research and study in the field of building and construction at ETH Zurich, initially in the current Department of Civil, Environmental and Geomatic Engineering and in its successor unit.	Zurich	CHF	Switzerland	20	100
Individually immaterial associated entities							
Archives of Contemporary History Foundation	Foundation	Promoting, safeguarding the long-term existence of and extending ETH Zurich's Archives of Contemporary History as a documentation and research centre for general and Swiss contemporary history.	Zurich	CHF	Switzerland	43	100
Foundation for Contemporary Jewish History	Foundation	Setting up and promoting a documentation centre for contemporary Jewish history within ETH Zurich's Archives of Contemporary History.	Zurich	CHF	Switzerland	20	100

¹ Even though ETH Zurich has less than 20 percent of the voting rights in the ETH Zurich Foundation, ETH Zurich can still exercise significant influence over the Foundation and is also the sole beneficiary. It is therefore classified as an associated entity.

² As in the previous year, except for Archives of Contemporary History Foundation (previous year: 25 percent of voting rights).

Restrictions

At the controlled and associated entities listed above, ETH Zurich does not have any rights of access to the assets. Therefore, it cannot initiate a transfer of liquid funds or otherwise access the entities' funds.

Entities below the thresholds defined in the OFA

The Ordinance on the Finance and Accounting of the ETH Domain (OFA) contains more detailed guidance on consolidation. It

also defines thresholds for inclusion in the annual consolidated financial statements. In accordance with Appendix 2 to this Ordinance, entities that meet the criteria for consolidation or equity method accounting, but fall below those thresholds must be disclosed as follows and are not included in the annual consolidated financial statements of ETH Zurich:

	31.12.2019	31.12.2018
Controlled entities		
Quantity	5	4
Total assets (CHF million)	13	12
Associated entities		
Quantity	5	5
Total assets (CHF million)	14	14

33 Events after the reporting date

ETH Zurich's financial statements were authorised for issue by ETH Zurich's President and Vice President of Finance and Controlling on 24 February 2020. No significant events occurred

prior to that date that would require disclosure in or an adjustment to ETH Zurich's financial statements for the period ended 31 December 2019.



Reg. Nr. 1.20306.934.00120.002

Report of the statutory auditor

to the President of the Swiss Federal Institute of Technology, Zurich

Report on the audit of the consolidated financial statements

Opinion

We have audited the consolidated financial statements of the Swiss Federal Institute of Technology of Zurich (ETH Zurich), which comprise the consolidated statement of financial performance 2019, the consolidated balance sheet as of 31 December 2019, the consolidated statement of changes in equity and the consolidated cash flow statement for the year then ended, and notes to the consolidated financial statements, including a summary of significant accounting policies.

In our opinion the consolidated financial statements (pages 69 to 107) present fairly, in all material respects, the consolidated financial position of the ETH Zurich as of 31 December 2019, and its consolidated financial performance and its consolidated cash flows for the year then ended in accordance with the International Public Sector Accounting Standards (IPSAS) and legal requirements and the Accounting Manual for the ETH Domain.

Basis for Opinion

We conducted our audit in accordance with Swiss Law, International Standards on Auditing (ISAs), Swiss Auditing Standards and article 35a^{ter} of the Federal Act on the Federal Institutes of Technology (SR 414.110). Our responsibilities under those standards are further described in the Auditor's responsibilities for the audit of the consolidated financial statements section of our report. We are independent based on the Federal Auditing Act (SR 614.0) and the requirements of the audit profession and we have fulfilled our other ethical responsibilities in accordance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other information in the Annual Report

The Executive Board of the ETH Zurich is responsible for the other information in the annual report. The other information comprises all information included in the annual report, but does not include the consolidated financial statements and our auditor's report thereon.

Our opinion on the consolidated financial statements does not cover the other information in the annual report and we do not express any form of assurance conclusion thereon.

In connection with our audit of the consolidated financial statements, our responsibility is to read the other information in the annual report and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. In this context, please refer to the section Report on other legal and regulatory requirements at the end of this report.

Responsibilities of the Executive Board of the ETH Zurich for the consolidated financial statements

The Executive Board of the ETH Zurich is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with the International Public Sector Accounting Standards (IPSAS) and the legal requirements (Ordinance on the ETH Domain, SR 414.110.3; Ordinance on the Finance and Accounting of the ETH Domain, SR 414.123; Accounting Manual for the ETH Domain), and for such internal control as the Executive Board determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, the Executive Board of the ETH Zurich is responsible for assessing the ETH Zurich's ability to continue as a going concern, disclosing, as applicable, matters related to going concern.

Auditor's responsibilities for the audit of the consolidated financial statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Swiss law, ISAs and Swiss Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with Swiss law, ISA's and Swiss Auditing Standards, we exercise professional judgment and maintain professional scepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the ETH Zurich's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made.
- Conclude on the appropriateness of the Executive Board of the ETH Zurich's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the ETH Zurich's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the notes to the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the ETH Zurich to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the ETH Zurich to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the audit of the consolidated financial statements. We remain solely responsible for our audit opinion.

We communicate with the Executive Board of the ETH Zürich and the Audit Committee of the ETH Board regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Report on other legal and regulatory requirements

In accordance with the Federal Auditing Act and Swiss Auditing Standard 890, we confirm that an internal control system exists, which has been designed for the preparation of the consolidated financial statements according to the instructions of the ETH Board.

In accordance with Art. 21 par. 2 of the Ordinance on the Finance and Accounting of the ETH Domain, we confirm that no contradictions exist between the personnel reporting in the annual report (management report) and the consolidated financial statements. Likewise, we confirm that no contradictions exist between the financial figures in the annual report (management report) and the consolidated financial statements.

Furthermore, in accordance with Art. 21 par. 2 of the Ordinance on the Finance and Accounting of the ETH Domain, we confirm that risk management has been appropriately conducted according to the instructions of the ETH Board.

We recommend that the consolidated financial statements submitted to you be approved.

Berne, 24 February 2020

SWISS FEDERAL AUDIT OFFICE



Martin Köhli
Licensed audit expert



Patrik Lüthi
Licensed audit expert

DONATIONS

Many companies, foundations, private individuals and alumni are keen to support education and research in partnership with ETH Zurich. In doing so, they make an important contribution to Switzerland's status in science and business and to its international competitiveness. On behalf of our researchers and students, ETH Zurich would like to thank all our donors and supporters for their generous contributions, and for the trust they place in us.

Companies	
ABB Schweiz	Microsoft
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ASML	Petrofer
Avaloq	Philips
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Foundations and organisations

ACCENTUS Foundation, Verena Guggisberg-Lüthi Fonds
ACCENTUS Foundation, Walter Muggli Fonds
Adrian Weiss Stiftung
Albert Lück-Stiftung

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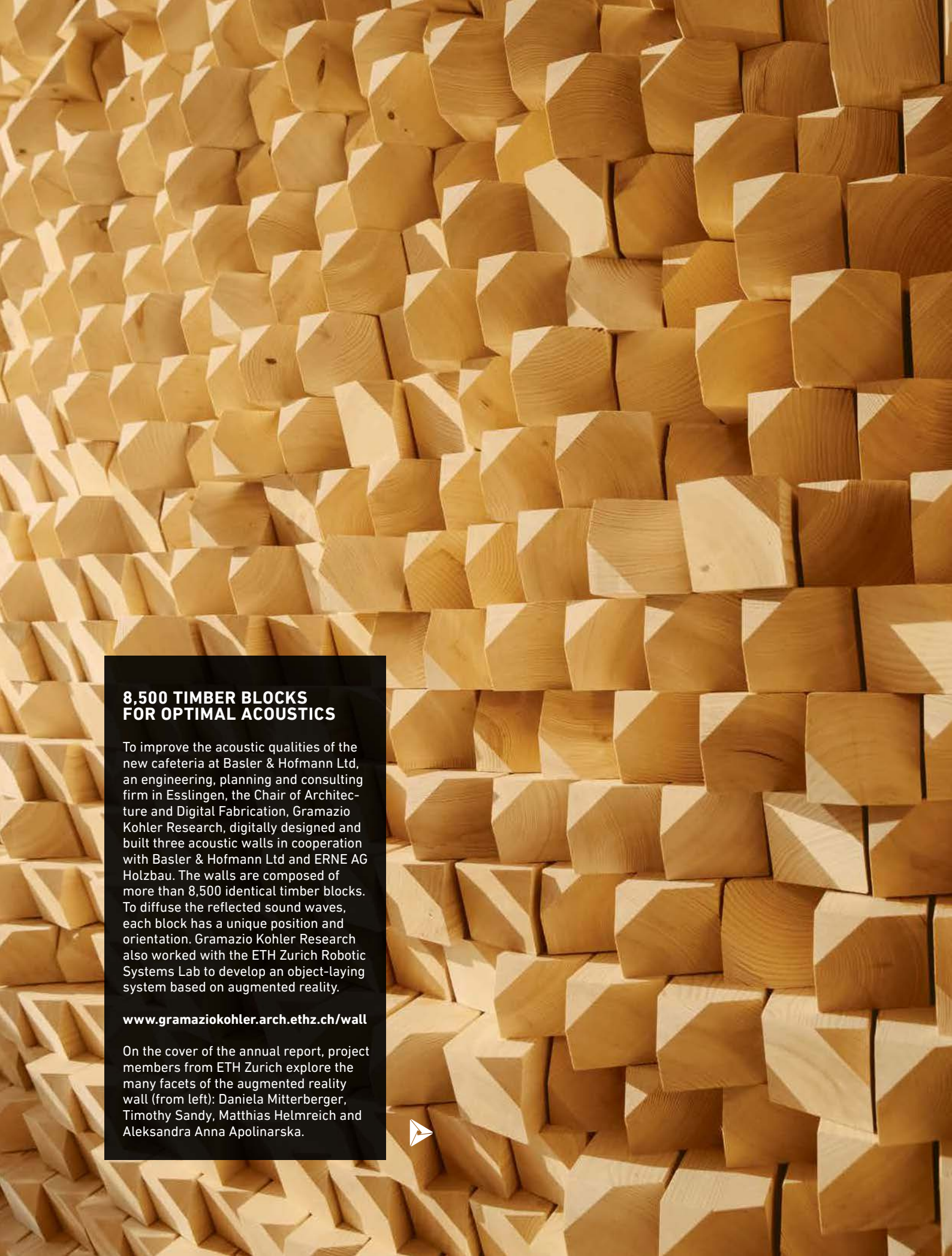
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8,500 TIMBER BLOCKS FOR OPTIMAL ACOUSTICS

To improve the acoustic qualities of the new cafeteria at Basler & Hofmann Ltd, an engineering, planning and consulting firm in Esslingen, the Chair of Architecture and Digital Fabrication, Gramazio Kohler Research, digitally designed and built three acoustic walls in cooperation with Basler & Hofmann Ltd and ERNE AG Holzbau. The walls are composed of more than 8,500 identical timber blocks. To diffuse the reflected sound waves, each block has a unique position and orientation. Gramazio Kohler Research also worked with the ETH Zurich Robotic Systems Lab to develop an object-laying system based on augmented reality.

www.gramaziokohler.arch.ethz.ch/wall

On the cover of the annual report, project members from ETH Zurich explore the many facets of the augmented reality wall (from left): Daniela Mitterberger, Timothy Sandy, Matthias Helmreich and Aleksandra Anna Apolinarska.

