ETH zürich

Annual report 2021

ETH IN FIGURES

STUDENTS
headcount (rounded)

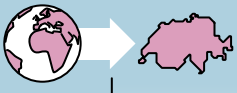
24,530
students

of which **675**
MAS/MBA students
(incl. teaching diploma)

33.3%
women

from **120**
countries

of which **4,460**
doctoral students



16% of Bachelor's students
42% of Master's students
74% of doctoral students

37%
international students

STAFF HEADCOUNT
full-time equivalents,
annual average (rounded)*

173
apprentices

34.9%
women

6,612
scientific staff
(incl. doctoral students)

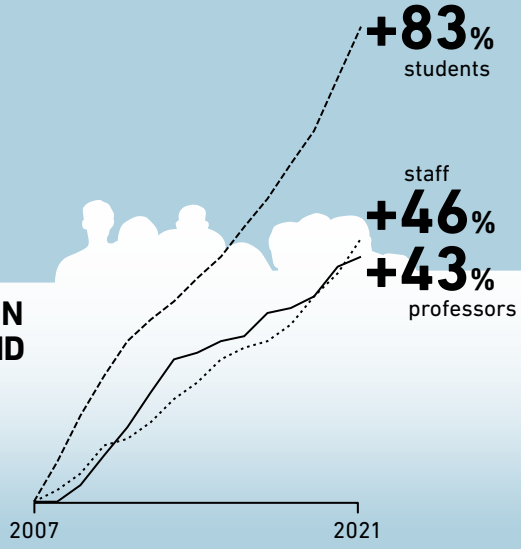
527
professors

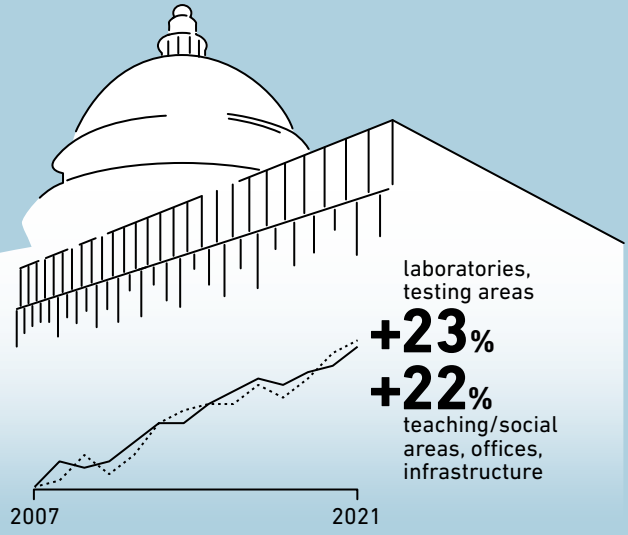
3,106
technical and administrative staff

+3.2%
increase
in staff
vs 2020

* Incl. Singapore-ETH Centre

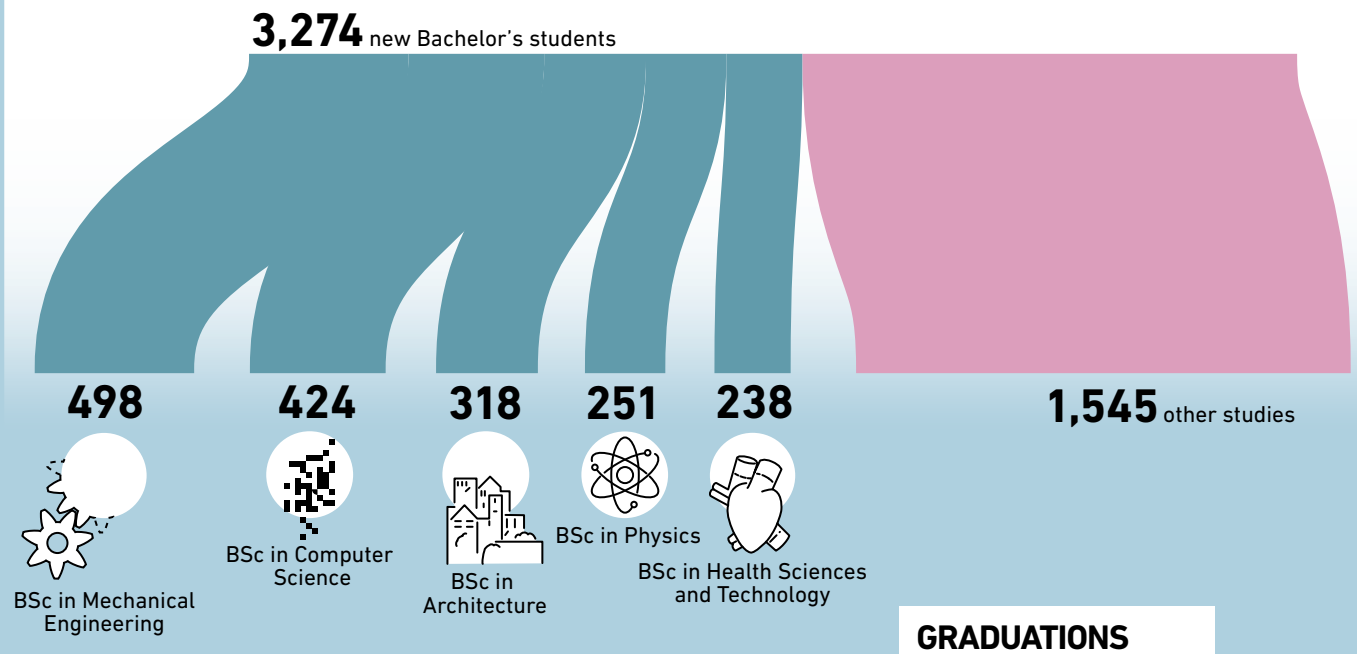
INCREASE IN PEOPLE AND FACILITIES





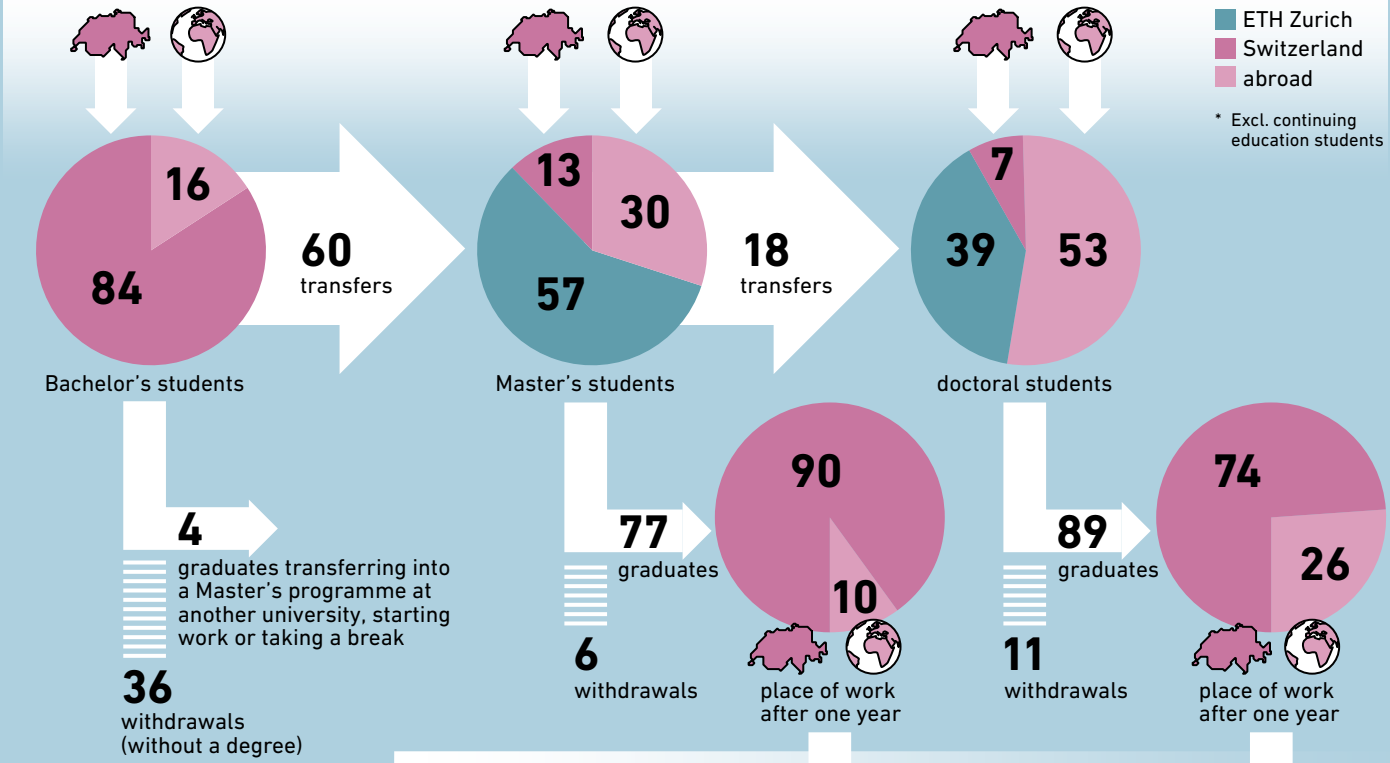
NEW STUDENTS

Bachelor's programmes with the most entrants



GRADUATIONS AND TRANSFERS

6-year average in %*



EMPLOYMENT

Rate of alumni employment after one year

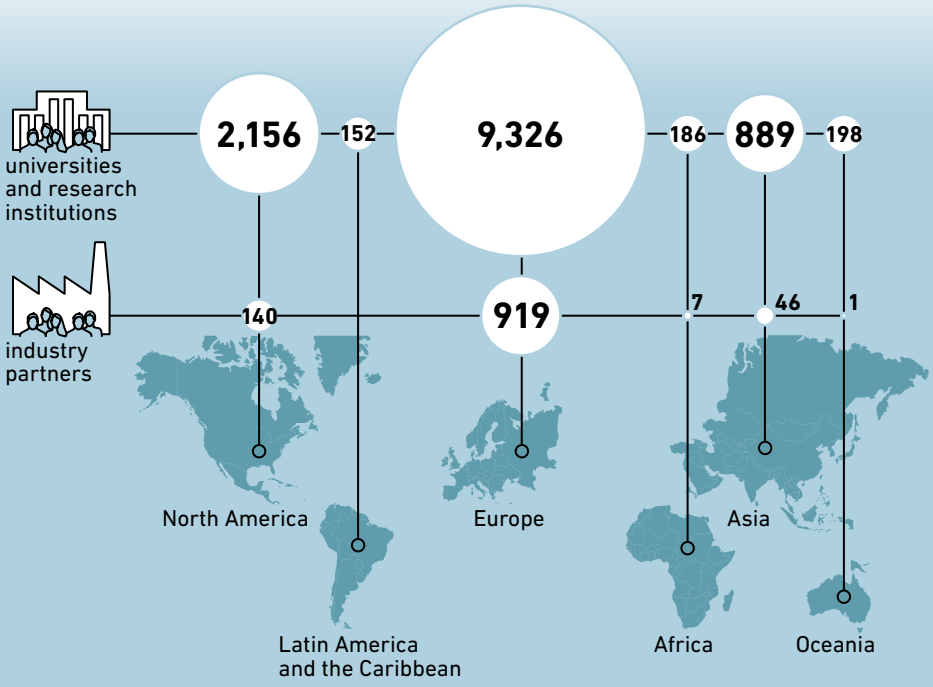
FSO Survey of Higher Education Graduates 2011–2019 (economically active persons only)

98% Master's

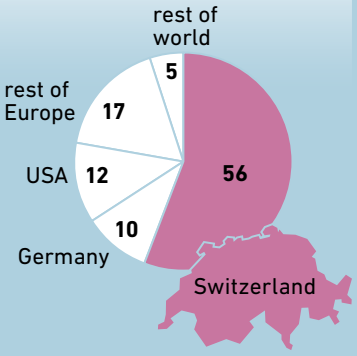
97% Doctorate

NATIONAL AND INTERNATIONAL RESEARCH CONTACTS

Number of individual contacts



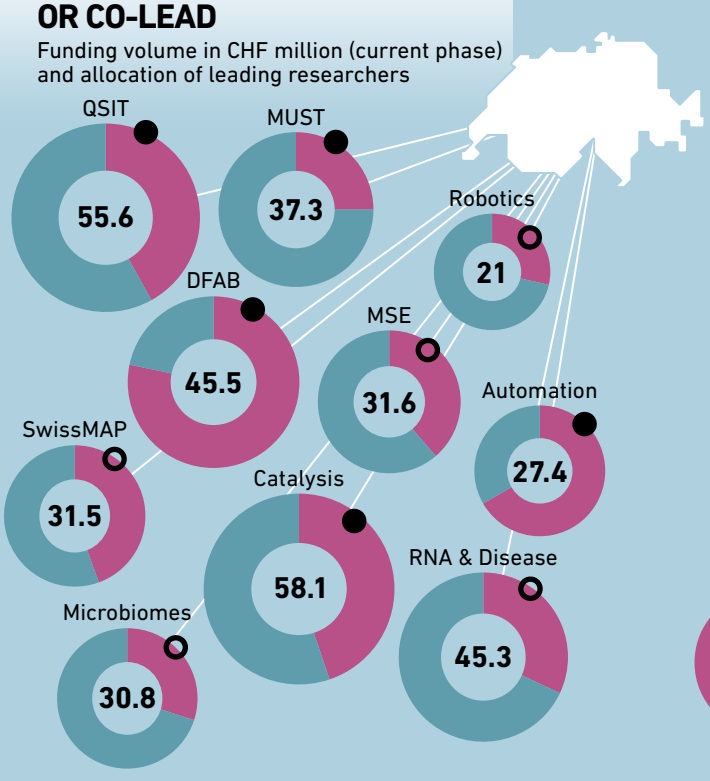
Private sector research contacts, in %



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

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

Funding volume in CHF million (current phase) and allocation of leading researchers

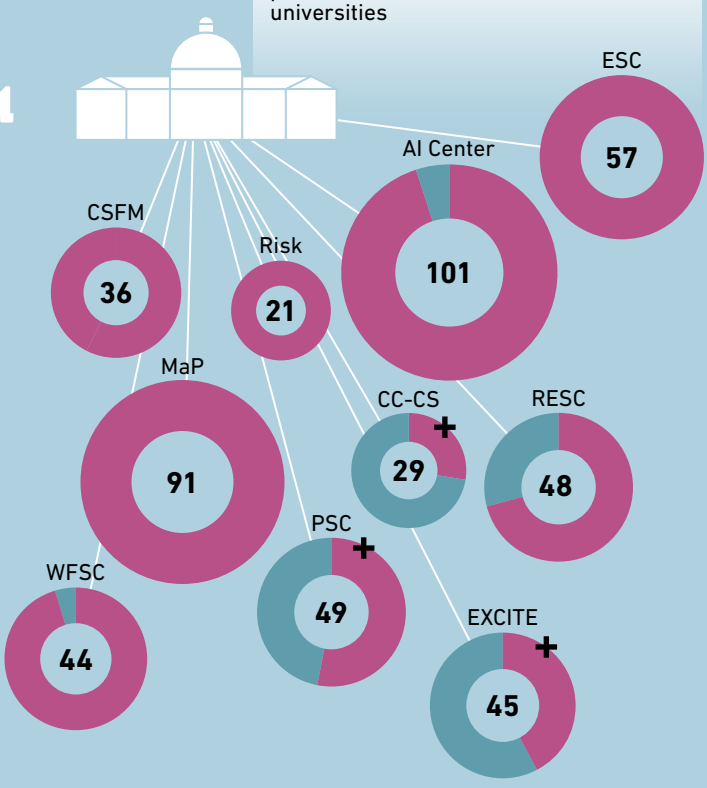


ETH
non-ETH
ETH lead
ETH co-lead

Further information:
ethz.ch/nccr

CENTRES OF COMPETENCE

Number of professors in each centre and the proportion of professors from ETH or other universities

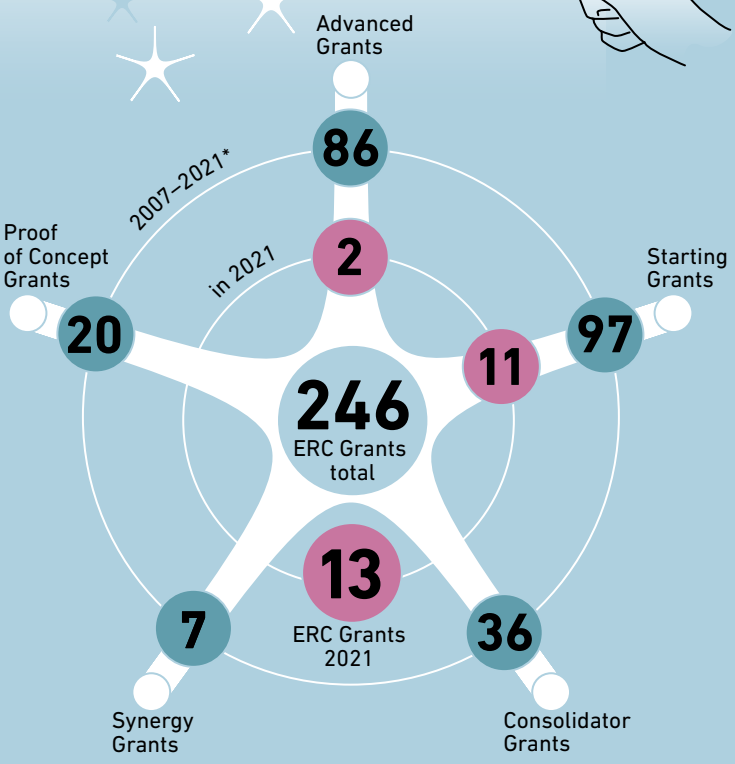


ETH
non-ETH
+ collaboration with other universities or institutions

Further information:
ethz.ch/competencecentres

SUCCESS WITH ERC GRANTS

Projects awarded by the European Research Council (ERC) since 2007



	in CHF m
total received since 2007*	540.7
in 2021	25.2

* Including SNSF Grants in 2014. Historical exchange rates have been adjusted to improve accuracy.

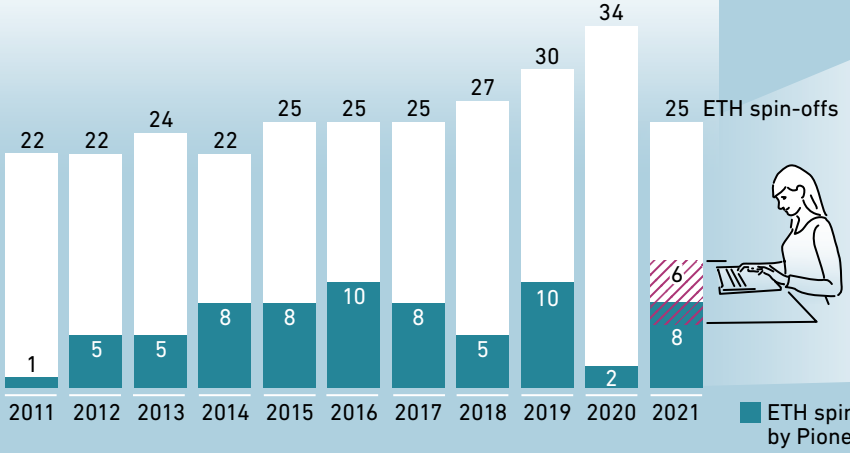
PATENTS, LICENCES, INVENTIONS

193 inventions (incl. 24 software disclosures)

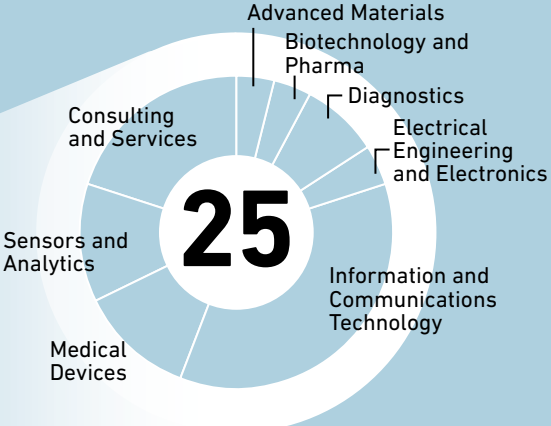
99 patents

45 licences

SPIN-OFFS



25 ETH spin-offs



ETH spin-offs founded by Pioneer Fellows

ETH spin-offs founded by women (CEOs)

INTERNATIONAL PRIZES

The most renowned prizes awarded to ETH researchers since 1901

1 Turing Award

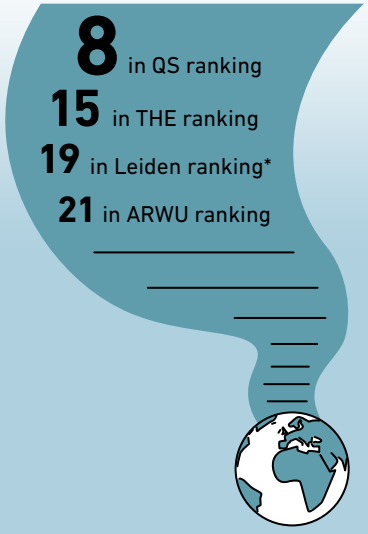
3 Pritzker Prizes

22

Nobel Prize winners (including Albert Einstein and Wolfgang Pauli)

2 Fields Medals

PLACES IN INTERNATIONAL UNIVERSITY RANKINGS



8 in QS ranking

15 in THE ranking

19 in Leiden ranking*

21 in ARWU ranking

* CWTS Leiden Ranking 2021: the proportion of ETH publications in the top 10 most highly cited publications

COMPOSITION OF TOTAL REVENUE

in CHF million, consolidated (in accordance with IPSASs)

federal financial contribution

1,310

69%

1,896

total revenues

31%

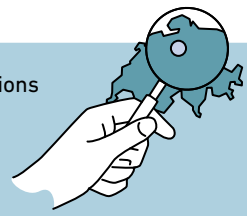
586

third-party funding revenue incl. surplus/deficit from associated entities

6%	19%	5%	1%
104 self-generated revenues	**366** research contributions	**89** donations and bequests	**27** surplus/deficit from associated entities

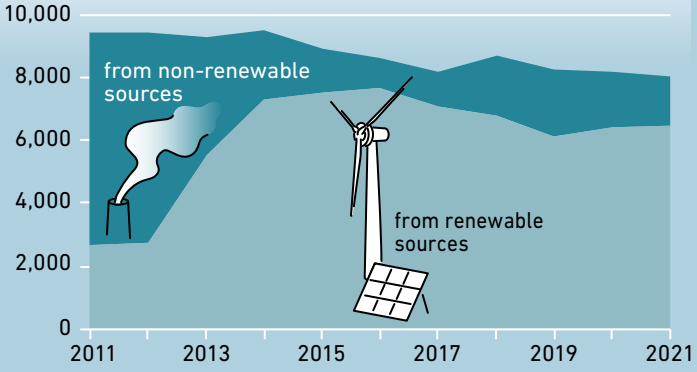
		industry-oriented research	
190 SNSF contributions	**81** European research frame-work programmes	**61**	**34** other project-oriented third-party funding

tuition fees		
32 net finance income /expense	**36**	**37** other revenue



ENERGY USAGE PER HEAD

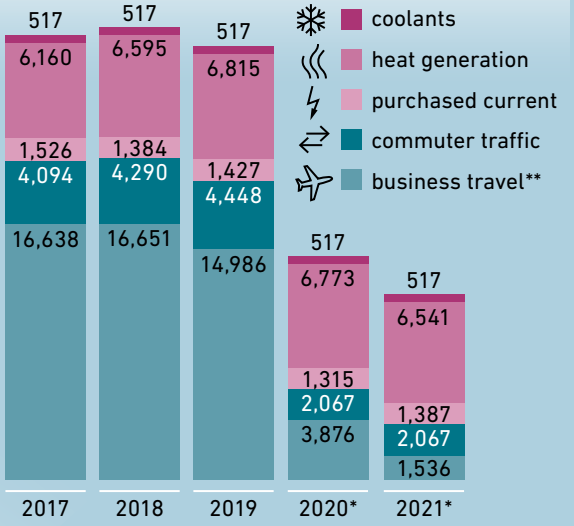
Electricity and heating consumed by ETH Zurich in Zurich, Lugano and Basel (kEh/FTE)*



* Employees and students (students count as 0.68 FTEs)

GREENHOUSE GAS EMISSIONS

Annual comparison of ETH Zurich's greenhouse gas emissions in tonnes of CO_2 equivalent*. The five most significant sources are shown.



See also ETH Sustainability Report 2019/2020

* Due to the COVID-19 pandemic and the emergency operations on campus in large parts of 2020 and 2021, campus presence and computer traffic were estimated at 45 percent.

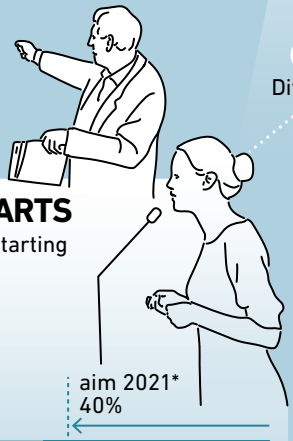
** New calculation method for flight emissions used in 2020 and 2021. Not all student-related flight data is available for 2021.

SUSTAINABILITY GOAL CATEGORIES

ETH Zurich tracks 45 sustainability goals* in 15 categories

* The individual categories contain different numbers of goals

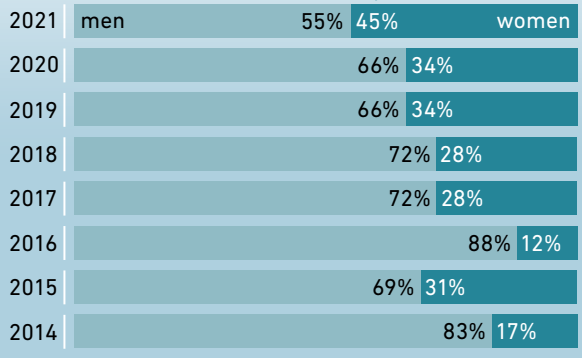
More information at: ethz.ch/diversity-en and ethz.ch/sustainability



PROFESSOR NEW STARTS

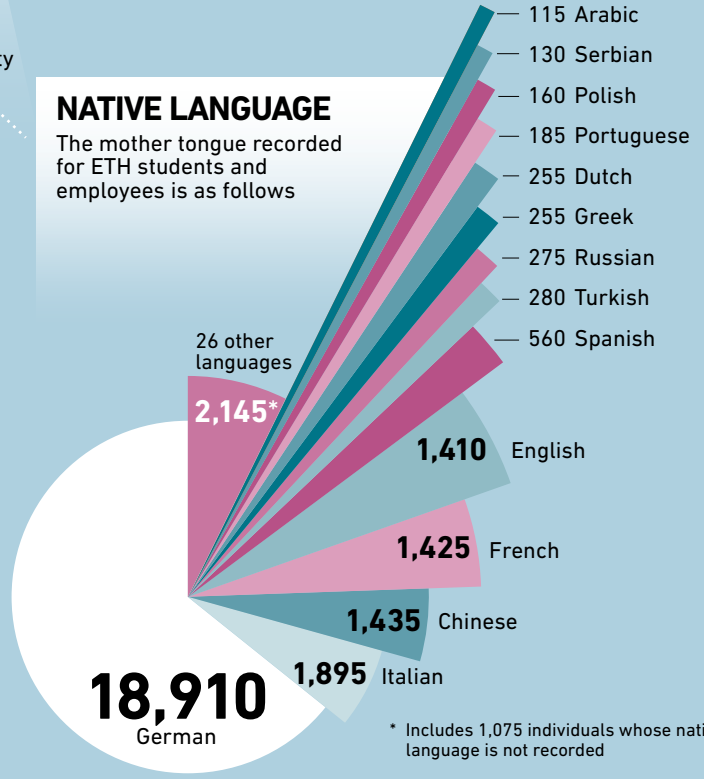
The proportion of professors starting their role in %

* ETH aim: at least 40% of new professor appointments women



NATIVE LANGUAGE

The mother tongue recorded for ETH students and employees is as follows



* Includes 1,075 individuals whose native language is not recorded

The past year has brought challenges on three fronts: coronavirus, climate change and links with Europe. While new variants of Sars-CoV-2 were the main concern during the second year of the pandemic, governments meeting at COP21 sought commitments for more coordinated efforts in combatting climate change. For Swiss universities, 2021 also marked a turning point, as they were shut out of the EU research programme Horizon Europe.

Despite these challenges – and several others besides – ETH Zurich performed well during the year under review. Teaching has seen some important innovations, including a Competence Framework designed to promote a more holistic skills set, the launch of a project to strengthen computational competencies in all degree programmes and new rules for the doctorate that include allocating two advisors to doctoral students. A new joint doctoral programme in Learning Sciences offered by ETH Zurich and EPFL is also expected to generate fresh impetus.

Basic research is a game with an uncertain outcome. Even so, it is precisely this type of scientific activity that has produced so much innovation at ETH and therefore occupies a special place at our university. In this context, we have joined forces with the Paul Scherrer Institute (PSI) to set up a new quantum computing hub, and launched the EXCLAIM project, a platform for modelling both global and regional weather and climate processes with an accuracy of one kilometre. The bar has been set very high, and such an undertaking would be impossible without the cooperation of strong national and international partners. Networks are also vitally important in other strategic areas, such as medicine and healthcare, to speed up knowledge transfer from the laboratory to clinical research – and eventually to practical applications.

In recent years ETH has stepped up the transfer of knowledge and technology in the drive to develop solutions for the here and now, as evidenced by our many industry partnerships and thriving start-up culture. The university's appetite for founding new companies has produced 25 new start-ups that have attracted total venture capital in the region of 400 million Swiss francs. They are doing well in the market as they advance innovative technologies, ranging from carbon capture and storage to more efficient PCR tests and autonomous robots.

Many ETH researchers have won national and international awards. One of the most prestigious is the Pritzker Architecture Prize presented to Anne Lacaton and her partner, Jean-Philippe Vassal. The two professors of chemical engineering Wendelin Stark and Robert Grass have been honoured with the European Inventor Award, while Nicola Aceto, an ETH specialist in cancer research, was awarded the Swiss Science Prize Latsis.

Scientific expertise is not just to be found in the laboratory or lecture hall: it has also become increasingly important in the provision of advice to public authorities and administrations. The enormous commitment shown by ETH members in this field often stays under the radar, and I would like to expressly acknowledge their efforts, even if their work attracts no prizes.

As always, my sincere thanks go to all political and government representatives, industry partners and taxpayers for their vital support of our research. We will continue to push scientific boundaries and look forward to maintaining a constructive dialogue with you.

Joël Mesot, President of ETH Zurich

CONTENTS

Front cover: ETH Zurich/Jasmin Frei; back cover: ETH Zurich/Alessandro Della Bella; Markus Bertschi

Cover photo: Opened in October 2021, the Student Project House on the Zentrum campus is a space for students to put their ideas into practice.

HIGHLIGHTS

► Other highlights in ETH News:

NEW QUANTUM COMPUTING HUB

ETH Zurich and the Paul Scherrer Institute (PSI) have established a joint centre for the development of quantum computers whose mandate is to develop quantum computers capable of processing over 100 quantum bits (qubits). As a comparison, ETH computers currently only operate with up to 17 qubits. ETH has provided funding of 32 million Swiss francs for the new ETH Zurich – PSI Quantum Computing Hub, which will be home to around 30 researchers working to advance the development of quantum computers based on ion traps and superconducting components. Locating both technologies in the same laboratory should create useful synergies for the scientists. ETH professors Andreas Wallraff and Jonathan Home are the joint heads of the new centre.

► Quantum computing hub:

KellenbergerKaminski Photographie / ETH Board

SUMMER SCHOOL IN A HYBRID FORMAT

At the "Rethinking Waste" Summer School, student teams from ETH Zurich and Kwame Nkrumah University of Science and Technology (KNUST), Ghana, explored the topic of solid waste management. Each team was guided not only by their own tutors but also by experts from the partner university via a remote link. Through a series of workshops and excursions, students first identified underlying problems, before coming up with concrete solutions for specific case studies.

150 YEARS OF AGRICULTURAL SCIENCES

The original agricultural school at ETH Zurich has changed dramatically since its inception in 1871. What began with three professors and five students has expanded to twelve professorships today, plus another eight in association with other academic departments. Whereas the emphasis in the past was on optimising production, the goal now is to develop a form of agriculture that is both multifunctional and sustainable. Current agricultural research is responding by focusing increasingly on areas such as robotics and artificial intelligence.

SWISSLOOP TUNNELING TEAM REACHES THE FINAL

Swissloop Tunneling, with team members from ETH Zurich, reached the final in a competition held by Elon Musk. Their seven-metre-long tunnel boring machine made it to second place in the Nevada desert. Their machine also won the innovation and design award, being the only one able to fabricate the supporting tunnel lining in situ. For this technique, a special polymer mixture is applied to the tunnel wall, where it hardens immediately.

NOBEL LAUREATE MOVES TO ETH

Didier Queloz, Geneva astronomer and winner of the 2019 Nobel Prize in Physics, has been appointed the first director of the new ETH Center for the Origin and Prevalence of Life, where scientists from different disciplines will investigate the origin of life. In recent years, considerable strides in this area have not only been made in astronomy but also in biochemistry and molecular biology. Further research should now help unravel the secrets of the origin of life.

PLANT-BASED MEAT IS A BIG SUCCESS

Planted Foods AG won the Swiss Startup Award 2021. The successful ETH spin-off produces meat analogues and in 2021 had already attracted investments totalling 43 million Swiss francs in two additional financing rounds. The ETH Zurich Foundation also funds the young company, founded in 2019. In addition to supplying food retailers Migros and Coop in Switzerland, Planted Foods is now delivering its products to supermarket chains and food service partners in several European countries.

EXPERIENCING SCIENCE UP CLOSE

Is breast milk better for babies than formula? And how do you produce tissue for skin transplants? Scientifica 2021 provided visitors with answers to these and many other questions under the slogan “Synthetic naturally”. This year the science showcase organised by ETH and the University of Zurich was held at three different sites for the first time. Public interest in experiencing science up close was once again extremely high, with over 10,000 visitors attending the event.

ETH Zurich/Nicola Pitaro; obs/AWK Group AG/Immanuel Denker; Janick Entremont; Keystone; Thomas Rafalzyk; Alessandro Della Bella/Scientifica

SCIENCE AS A LEVER FOR DIPLOMACY

ETH Zurich and the University of Geneva have established the Lab for Science in Diplomacy (SiDLab) in Geneva to investigate the use of innovative technologies and quantitative methods to strengthen the link between science and diplomacy. The mission of the interdisciplinary research institute is to contribute scientific insights and methods to delivering diplomatic solutions to international conflicts and to tackling global challenges.

NEW TASK FORCE PRESIDENT

With coronavirus continuing to dominate the headlines in 2021, the federal government continued to draw on the scientific expertise provided by the Swiss National COVID-19 Science Task Force, which Tanja Stadler, Professor for Computational Evolution at ETH Zurich, has chaired since August 2021. As head of the Data and Modelling Expert Group, the mathematician makes vital contributions to a better understanding of SARS CoV-2 and its spread. Tanja Stadler took over from ETH professor Martin Ackermann as task force head.

DIVERSITY AS A SUCCESS FACTOR

One of the goals set out in ETH Zurich's Strategy and Development Plan 2021–2024 is to achieve a higher percentage of women in teaching and research, so as to improve diversity and produce high-quality scientific work. There should also be more women in management roles and committees in future, with the university aiming to fill 40 percent of new professorships with female academics. ETH already beat this target in 2021: 13 female professors took up posts at ETH, equivalent to a share of 45 percent.

UNIGE/Marco Cattaneo; ETH Zurich/Giulia Marthaler; Keystone; ETH Zurich/Ilg Santer Architekten; ETH Zurich/Gian Marco Castelberg; ETH Zurich/Oliver Bartenschlager

NEW BUILDINGS AND MODERN SPATIAL CONCEPTS

ETH Zurich is continuously developing its infrastructure. Through zone planning, upgrades and newbuilds, such as the new HPQ Physics Building on the Hönggerberg campus, the university is laying a solid foundation for state-of-the-art teaching and research, as well as knowledge and technology transfer. Innovative space and office concepts play a key role in this respect and will reflect modern forms of working and cooperation.

UNIVERSITY FUNDRAISING AWARD 2021

The ETH Zurich Foundation fosters innovation by working with private individuals, companies and foundations to promote teaching and research at ETH Zurich. Collaboration with companies plays a vital role in this regard. The Foundation has received the University Fundraising Award 2021 from the German Association of University Professors and Lecturers (DHV) for its corporate fundraising activity. The prize money of 5,000 euros is intended to go towards fundraising or a specific project.

ETH RECTOR STEPS DOWN

After seven years as rector, Sarah M. Springman retired on 31 January 2022. She can look back on a long and successful scientific career. She was first appointed Professor of Geotechnical Engineering at ETH in 1997. ETH President Joël Mesot paid tribute to Springman at ETH Day 2021, praising her efforts to provide students with the best possible support in teaching and personal development, as well as acting as a mentor in the area of diversity.

TEACHING

Our degree programmes provide students with a solid methodological foundation and technical expertise, the capacity for interdisciplinary and systemic thinking, and transferable skills. We foster a culture of autonomous learning that boosts students' individual strengths and allows them flexibility in designing their study programme. Transferable skills include the ability to be mindful and take care of their own physical and mental health. The tight restrictions being placed on student life on campus have underlined the value of proper support and counselling. ETH also ran a mental health campaign to draw students' attention to the various counselling options available.

ETH Zurich / Jasmin Frei

STUDENT PROJECT HOUSE OPENED

A smart walking aid for the blind, or a house that manages itself thanks to the blockchain: these ideas – and many more besides – are being explored in the new Student Project House located next to the ETH Main Building. Opened in October 2021, the Student Project House gives students free rein to realise their ideas without any pressure to achieve good grades. The former district heating plant acts as a tech hub for students to share creative ideas across five floors offering co-working spaces, communal areas and a tool shop. They also have access to coaching opportunities and workshops.

► Student Project House:

ETH Zurich/Alessandro Della Bella

FOSTERING ALL-ROUND ABILITIES

ETH Zurich gives students a first-class academic education. On top of that, the university strives to develop their social and personal skills to provide them with the best-possible basis on which to build their future careers.

By Ori Schipper

ETH Zurich has an excellent reputation for the quality of its education, as evidenced by its top rankings in university tables and the results of the alumni survey carried out by Switzerland's Federal Statistical Office. Overall, alumni say their technical knowledge meets their employer's expectations. But they feel they are not as well equipped when it comes to social and personal skills, such as how to work effectively in a team or manage change productively.

Fostering a holistic set of competencies

To fill this gap, Rector Sarah Springman launched the ETH Talent Project in 2018 with the declared aim of creating more space in the curriculum for students to develop these competencies. In future, ETH alumni will of course still be highly trained in their chosen technical field, but should also acquire self-management competencies. As multi-talented professionals they should be able to develop personal relationships in their pursuit of achieving common goals in a constructive atmosphere. In the words of one ETH alumnus: "If you want to create change in this world, you not only need to make your own contribution, but you have to also help others make a significant contribution. Teamwork tends to produce better results than individual efforts."

▲ At ETH Week in September, students from all disciplines grappled with the complex issues surrounding "Health for Tomorrow".

The ETH Talent Project team reviewed the relevant literature and conducted interviews with educational and career experts, as well as with Swiss employers from different business sectors. Based on this analysis, they produced an ETH Competence Framework comprising not only subject- and method-specific competencies but also 13 transferable skills. According to the project's website, this framework is for "guiding and inspiring the personal and professional development of students and the work of teaching staff members at ETH Zurich." It is designed to give students an overview of where and when they can acquire certain skills, and possibly decide whether they want to attend a specific lecture in the curriculum, or sign up for an extracurricular activity.

"By the time they complete their studies, we want ETH graduates to be able to help shape the future as independently minded people," says Sarah Springman. Two quite different initiatives show the importance the university attaches to fostering independent thinking and action. In the Student Project House, ETH students have access to infrastructure and tools, such as laser cutters and 3D printers, so they can apply their ideas and build prototypes. The second initiative, PRISMA, was developed by students: its mission is to support Bachelor's students in developing cross-disciplinary skills on top of their technical education, encouraging them to think outside the box.

Teaching enriched by students' initiative

"As the PRISMA team, we believe that students can learn to understand their own field better through contact with real-world problems and discussing them with others," says Elizabeth Weirich Benet, who is due to complete her Master's degree in Atmospheric Physics next year. She gets paid for her work with PRISMA from funds raised by her predecessors following their successful application to the Innovedum Fund, which supports university projects that advance education at ETH. Unlike most other teaching innovations, it was students that came up with the idea for PRISMA.

PRISMA combines several different approaches, ranging from a short series of teaching modules to single events and a one-week block course. For this last option, PRISMA offers Master's students the opportunity to train as coaches. The block course is derived from the ETH Week. This event, first held in 2015, takes place in the last week of the holidays before the Autumn Semester and brings together around 200 students to work in interdisciplinary teams on socially relevant topics. Here, students are free to choose any problem they want to tackle by applying the Design Thinking method. At the end of the week the students present their ideas for potential solutions.

"Design Thinking is a method of being creative in a more structured manner," says Weirich Benet. Obviously, not all the ideas for solutions would be implemented. What's much more important are the learning processes experienced during interactive work as part of a team. Setting a didactic goal would obstruct ideas for a solution.

Alan Cabello Llamas, another member of the PRISMA team, runs the block course. "The key element is that participants learn to consider a problem from different angles, so they understand what the challenge actually involves," says Cabello Llamas. "I always say they have to fall in love with the problem, so they are more likely to find suitable answers to the question: what am I actually trying to solve here – and why?"

Weirich Benet's main responsibility at PRISMA is the Sprinkles project, where PRISMA elements are, so to speak, "sprinkled" across the curriculum. She studies the existing teaching content of basic courses and then meets with course tutors and, provided they are amenable to the idea, discusses ways of integrating

"Students can learn to understand their own field better through contact with real-world problems and discussing them with others."

Elizabeth Weirich Benet, Head of PRISMA's Sprinkles initiative

▲ 120 students from 31 countries came together for ETH Week 2021.

interactive elements into their lectures. This could be something like a short quiz as an icebreaker at the start of a session, or discussions on the social impact of the technologies addressed in the lecture.

The suggestions put forward by Weirich Benet in collaboration with tutors are tailored to each individual lecture. "Although this approach incurs a lot of work, feedback shows it's effective: the new elements are well received by most students," says Weirich Benet. This very personalised style of coaching cannot be compared with standard teaching methods. Furthermore, PRISMA is driven by students. "This means there is a high turnover: a constant flow of new people with innovative ideas," she comments. This continual renewal is important, however, as it means PRISMA remains predominantly a student initiative.

Room for developing original ideas

A strong entrepreneurial spirit also pervades the Student Project House. Over the past five years, the first house on the Hönggerberg campus has already provided more than 2,500 students with a platform for putting their own ideas into practice. A succession of users has since proven that the combination of the technical knowledge acquired while studying and the courage to explore new paths can lead to exciting results and successful inventions. The "ideas laboratory" serves as a launchpad: several prototypes have since been developed into commercial products that are performing well in the market.

"We provide our students with an environment that goes beyond the traditional approach to education, so they have the ability to think independently."

Sarah Springman, Rector of ETH Zurich

A second house opened in October 2021 on the Zentrum campus. Both locations are seen as platforms with no fixed expectations, ideal for exchanging ideas. "By building and refining prototypes, visitors to the Student Project House work together and acquire many skills that extend well beyond the technical knowledge acquired in their course," says Springman. "The purpose of our ideas laboratory is to encourage students to try something new, while at the same time learning from their own mistakes."

The new space for developing original ideas covers more than 1,200 m^2 and is housed in a former district heating plant, a listed building of national importance located in Clausiusstrasse, Zurich. As with the original house on the Hönggerberg campus, students benefit not only from its physical infrastructure but also from numerous coaching opportunities and workshops where they can learn critical thinking techniques or work together in interdisciplinary teams, for example. "We want to educate our students to become sought-after global talents displaying strong technical skills and the ability to think independently. That's why we provide them with an environment that goes beyond the traditional approach to education," says Springman.

ETH Zurich/Alessandro Della Bella; HSG/ETH Zurich

ETH YOUTH ACADEMY

EFFECTIVE LEARNING OPPORTUNITIES IN MINT SUBJECTS

How can we get school children interested in topics that are central to ETH Zurich? Launched in January 2021, the ETH Youth Academy offers courses on mathematical and scientific topics that supplement and deepen their school lessons using materials specific to ETH. The teaching is provided by members of the MINT team. Since the scheme's launch, over 650 students have already registered.

The teaching materials were developed by the MINT-Learning Center in cooperation with various ETH departments. They have been optimised on the basis of recent research into teaching and learning methods to support school children's knowledge acquisition. Here, forms of learning based on cognitive activation are used in a targeted fashion. These have proven to be particularly effective in teaching MINT subjects to girls and young women. "If you first explain the underlying concepts, students are much more prepared to engage with topics," says Ralph Schumacher from the MINT-Learning Center. "Generally speaking, it's also important to consider common ideas and misconceptions, as they can be a barrier to learning." The courses are scientifically monitored to guarantee their learning effectiveness and continuously optimised.

◄ Most students are satisfied, but the pandemic has definitely left its mark.

STUDENT SURVEY

BACK ON CAMPUS

Students are less motivated when there is no campus life. This was the finding of the survey of Bachelor's and Master's students conducted in the spring of 2021. Only 57 percent of students agreed with the statement that they were still able to duly apply themselves to their studies despite the pandemic. Four out of five students blamed this on a lack of motivation and the absence of contact with fellow students. This was another reason the university worked as hard as it could to ensure that in-person teaching was possible at the start of Autumn Semester 2021.

According to the survey, 62 percent of students are satisfied or very satisfied with their studies, compared with 82 percent in 2015. Opinions on teaching were positive: 74 percent said their studies at ETH Zurich fostered their critical thinking skills. Some 92 percent of students feel interaction at ETH is respectful and 89 percent approve of the "non-discriminatory" learning environment.

Students struggle with time constraints: only 35 percent think the number of credits accurately reflects the work required. 68 percent say their holidays are not long enough to ensure they are fully rested before term restarts. ETH is aware of the time problem, which has been discussed at regular meetings with academic departments, lecturers and students. In addition, changes to the academic year were one of the topics considered at the "Teaching beyond COVID-19" teaching retreat.

► Student Survey 2021:

EXECUTIVE PROGRAMMES

ETH AND HSG LAUNCH A CONTINUING EDUCATION PROGRAMME

Modern executives face many different challenges: employees expect their work to be meaningful, and the rapid pace of technological progress requires managers to be flexible in their response to change. Moreover, their actions must always be socially responsible. Jointly developed by ETH Zurich and the University of St. Gallen (HSG), the new continuing education programme "emba X" has been designed with these requirements in mind. The MBA programme trains business executives to take on board social changes and ensure the company's business goals are aligned with them.

Stefano Brusoni, ETH professor and Co-Director of emba X, comments: "New technologies present new challenges for managers. They need to learn how to reconcile the conflicting goals of different interest groups from industry and society." The postgraduate programme teaches the basics of leadership, technology and general management as well as a great deal of applied knowledge. Students develop concrete solutions to current issues and expand their social and leadership skills.

► emba X:

▼ The ETH-HSG postgraduate programme runs for 18 months.

STUDENTS AND DEGREE AWARDS

Students	Total		Bachelor's students		Master's students		Doctoral students		MAS/MBA students		Visiting/ exchange students	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Headcount	**23,422**	**24,534**	**10,355**	**10,642**	**7,790**	**8,299**	**4,316**	**4,460**	**644**	**675**	**317**	**458**
Percentage women	33.2%	33.3%	33.1%	33.5%	31.6%	31.3%	34.3%	34.6%	45.2%	43.6%	35.6%	38.2%
Percentage international students	40.3%	42.0%	22.2%	23.5%	43.5%	45.2%	74.2%	74.7%	40.1%	42.8%	90.9%	92.8%
Total registrations	**24,115**	**25,091**	**10,945**	**11,105**	**7,806**	**8,317**	**4,316**	**4,460**	**730**	**751**	**318**	**458**
Architecture and Civil Engineering	3,651	3,763	1,799	1,858	1,247	1,228	437	465	121	139	47	73
Engineering Sciences	9,167	9,874	4,183	4,273	3,278	3,714	1,525	1,635	50	75	131	177
Natural Sciences and Mathematics	5,887	5,902	2,744	2,748	1,685	1,710	1,179	1,167	211	193	68	84
System-oriented Natural Sciences	4,438	4,513	2,173	2,178	1,196	1,215	893	908	124	120	52	92
Management and Social Sciences	972	1,039	46	48	400	450	282	285	224	224	20	32
New students	**8,301**	**8,617**	**3,357**	**3,274**	**3,119**	**3,408**	**1,021**	**1,062**	**256**	**282**	**548**	**591**
Architecture and Civil Engineering	1,282	1,243	553	532	491	420	92	118	57	83	89	90
Engineering Sciences	3,119	3,431	1,193	1,196	1,303	1,589	373	382	19	38	231	226
Natural Sciences and Mathematics	2,000	2,118	896	906	680	768	259	277	64	43	101	124
System-oriented Natural Sciences	1,529	1,459	697	625	487	473	222	224	32	29	91	108
Management and Social Sciences	371	366	18	15	158	158	75	61	84	89	36	43
Country of education												
Switzerland	15,689	15,899	9,317	9,350	4,695	4,851	1,156	1,173	484	476	37	49
EU	5,430	5,847	1,398	1,519	1,745	1,915	1,946	1,988	135	158	206	267
Rest of Europe	776	799	140	139	312	311	277	286	23	18	24	45
Asia	1,614	1,838	61	59	815	964	645	695	50	52	43	68
America	452	547	19	28	171	217	234	255	22	27	6	20
Africa	121	128	9	9	50	43	47	51	13	18	2	7
Australia and New Zealand	33	33	1	1	18	16	11	12	3	2	0	2

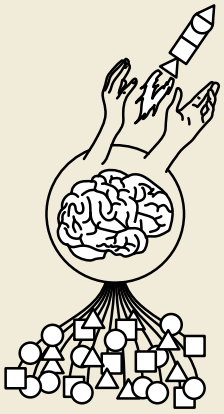
Degrees and diplomas	Total		Bachelor's degree		Master's degree		Doctorate		MAS		Teaching diploma/ MAS SHE		Teaching certificate	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Degrees	**5,075**	**5,917**	**1,843**	**2,084**	**2,260**	**2,748**	**781**	**820**	**129**	**173**	**31**	**46**	**31**	**46**
Architecture and Civil Engineering	930	867	377	317	439	405	70	80	44	65	0	0	0	0
Engineering Sciences	1,659	2,145	613	774	784	1,115	253	235	2	6	3	3	4	12
Natural Sciences and Mathematics	1,148	1,529	353	516	568	710	203	263	2	8	20	27	2	5
System-oriented Natural Sciences	1,101	1,141	492	465	385	426	187	191	4	14	8	16	25	29
Management and Social Sciences	237	235	8	12	84	92	68	51	77	80	0	0	0	0

► Student statistics:

A TEACHING OVERVIEW

NEW FORMS OF TEACHING AND LEARNING

Despite the pandemic, ETH Zurich not only maintained a high standard of education throughout 2021 but also continued to develop its teaching methods and opportunities. The combination of classroom and online tuition, for example, encouraged new forms of teaching and learning.



Huge efforts were made at every level – lecturers, study programmes, the Rectorate and IT Services – to maintain the usual high quality of tuition, despite the restrictions imposed by the pandemic. ETH had to continuously adjust teaching operations during the highly unpredictable course of the pandemic. While teaching was still mainly online during the Spring Semester, classroom teaching recommenced for most of the Autumn Semester, although admission to lectures was restricted to those with a COVID certificate. Lectures were recorded and put online for anyone unable or unwilling to attend in person.

The combination of classroom and online tuition encouraged new forms of teaching and learning. Lecturers were able to pass on to peers their experiences with novel teaching forms and good practice during the "Refresh Teaching" lunchtime events organised by the Educational Development and Technology department.

One of the biggest and most important educational development projects involves the greater promotion of computational competencies in all of ETH Zurich's Bachelor's and Master's study programmes. This project was launched in the 2021 reporting year. The project team has produced a competence framework, which it discussed with representatives from all study programmes and adapted accordingly. This framework sets out which computational competencies are required for specific professions and should ideally be acquired by ETH graduates in their respective field of study.

Milestone reform in the ETH doctoral programme

The passing of the new Ordinance on the Doctorate represents a milestone in the further development of the doctoral programme at ETH. The centrepiece of this reform concerns the supervision and personal development of doctoral students: from now on, they will all be allocated a second advisor in the first year of the doctoral programme. An aptitude colloquium will be held at the end of the first year, to be followed by an annual status conversation – based on a progress report – in subsequent years. Measures have also been put in place for the early flagging of problems in the doctoral programme. Independent research still lies at the heart of the doctoral thesis, but the main focus of supervision is effective support for the doctoral student.

Previously, ETH Zurich only had a formal agreement with the University of Zurich on joint doctorates. During the reporting year, ETH has agreed on a Joint Doctoral Programme in Learning Sciences with EPFL in Lausanne, the first joint doctorate between the sister institutions.

At the European level, bilateral agreements have also been reached with IDEA League partner universities TU Delft, RWTH Aachen and Politecnico di Milano on joint doctoral programmes in Earth Sciences. The programme goes under the name of EASYGO and is supported by EU funding.

Continuing education programmes with partner universities

ETH continues to expand its range of continuing education programmes. Six new courses were launched in 2021, while four other programmes were advertised for the first time. ETH offers three of these ten programmes in partnership with other universities: the Master of Advanced Studies ETH/EPFL in Urban and Territorial Design, offered jointly with EPFL, began at the start of the Autumn Semester. In partnership with the University of Zurich, ETH is offering a Master of Advanced Studies ETH UZH in International Governance and Law, which also started in autumn 2021. Finally, ETH has partnered with the University of St. Gallen to offer a new joint Executive MBA, which was launched in January 2022.

RESEARCH

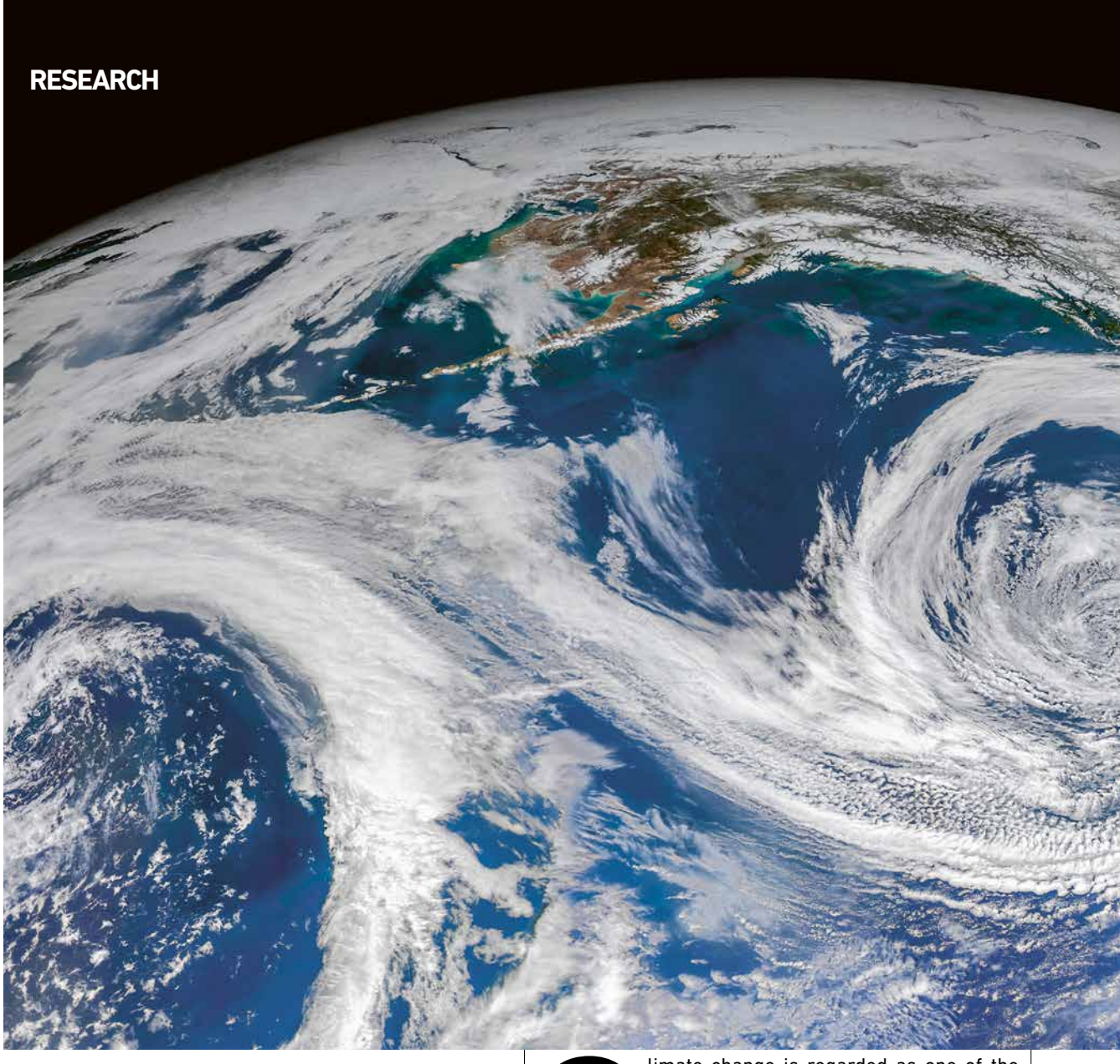
The research carried out at ETH Zurich provides the basis for future innovations and the development of our society. Thanks to a modern infrastructure and highly qualified staff, ETH Zurich is able to conduct both basic and applied research at the highest level. Technology platforms and competence centres support cooperation, while internal research funding provides the necessary space for excellence. The areas of research ethics and scientific integrity provide a normative framework.

ETH Zurich / Alessandro Della Bella

A FIRST LOOK INSIDE MARS

Together with an international team, researchers at ETH Zurich have been able to look inside Mars for the first time. This was made possible by a seismometer co-developed by ETH that has been providing data on marsquakes since 2019. Led by Professor Domenico Giardini, researchers Amir Khan and Simon Stähler used it to measure the crust, mantle and core of the red planet as part of NASA's InSight mission. The findings will aid our understanding of the formation and evolution of the entire solar system.

► Mars research:



LINKING CLIMATE MODELS WITH WEATHER MODELS

The EXCLAIM project takes climate and weather simulations to a new level. For the first time, a powerful computing and flexible software infrastructure makes it possible to link global climate models with regional weather models. ETH Zurich has been working closely with partner institutions to achieve this.

By Daniel Meierhans

Climate change is regarded as one of the greatest challenges of our time. The main effects of rising average global temperatures include an increase in extreme regional weather events, such as heat waves, heavy rainfall, thunderstorms and droughts. Understanding how changes in the atmosphere affect weather systems – and hence people's actual living conditions – requires models with the highest possible resolution.

Even more accurate forecasts

With the interdisciplinary research initiative EXCLAIM (Extreme scale computing and data platform for cloud-resolving weather and climate modeling), ETH Zurich is taking the accuracy of weather and climate modelling to a new level. The platform, developed jointly with partner institutions, will be able to run kilometre-scale global and regional weather and climate simulations. With this resolution, which has been improved by a factor of 30, the models will – among other things – be able to allow for phenomena such as the formation of convection clouds, which are responsible for violent summer thunderstorms.

By incorporating regional weather models directly into global climate simulations, EXCLAIM will also

Keystone

◀ With a resolution of one kilometre, EXCLAIM will enable very fine-scale climate modelling for the Alpine region.

enable researchers to understand, for the first time, how they interact with one another. It will also make it much easier to study the specific effects of climate change on regional weather. "Here in the Alpine region, EXCLAIM will allow us to predict much more reliably the frequency and severity of extreme weather events such as last summer's heavy rainfall," says Nicolas Gruber, leader of the EXCLAIM project. "This will help the government and businesses to invest their resources optimally in the necessary adjustments."

New infrastructure

To achieve the high goals that have been set, all the infrastructure needed for the simulations must either be developed from scratch or adapted to meet far more exacting requirements. For example, EXCLAIM requires the development of exascale supercomputing infrastructure. This next generation of high-performance computers will exceed the limit of 1 exa-flop (1,018 floating point calculations per second), making them over three times more powerful than the world's current fastest computers.

On the software side, a migration is necessary – from the current monolithic system software programmed in Fortran to a modular, Python-based system. This will increase flexibility in terms of the hardware and software architecture that can be used by the simulations. Fundamental improvements are also needed in the area of algorithms and data infrastructure.

Jointly pushing the limits of what is possible

Whether in terms of hardware, system software, model algorithms or data infrastructure: in all areas, EXCLAIM pushes beyond the limits of what was previously possible. This calls for a large network of project partners.

> **"EXCLAIM will allow us to predict much more reliably the frequency and severity of extreme weather events such as last summer's heavy rainfall."**
>
> **Nicolas Gruber, Head of EXCLAIM**

The Swiss National Supercomputing Centre (CSCS) of ETH Zurich, the Swiss Data Science Center (SDSC) of ETH Zurich and EPFL, the Swiss Federal Laboratories for Materials Science and Technology (Empa) and the Federal Office of Meteorology and Climatology (MeteoSwiss) are therefore working together under the umbrella of the ETH Center for Climate Systems Modeling (C2SM) to meet the challenges.

The CSCS team is using the project to develop a new supercomputing infrastructure. "It will be entirely geared to the requirements of weather and climate modelling," says CSCS Director Thomas Schulthess. The "Alps" infrastructure combines the advantages of traditional computer processors and graphics processors, which are geared towards parallelisable tasks, with new types of processors specialising in artificial intelligence (AI) applications. From 2023, the new platform will exceed the performance of the current CSCS mainframe computer by a factor of around 10.

Flexibility for new technologies and architectures

Thanks to the new Python-based software, however, EXCLAIM will also be able to integrate other hardware resources, such as the computer of the LUMI consortium (Large Unified Modern Infrastructure) in Finland, whose members include ETH and CSCS. For this purpose, the previous monolithic Fortran software is being modularised into system, model and interface components and rewritten in Python, a more suitable programming language.

By separating the backend, which provides the connection to the hardware systems, from the interfaces with the scientific applications, the software is not only able to integrate different hardware architectures or new AI technologies in much more flexible ways. The

▼ EXCLAIM:

separation also allows the team to better optimise simulation applications for different processor architectures, as Schulthess knows from experience: "Using this approach, we have already been able to speed up MeteoSwiss's current weather model by a factor of 10, which has markedly improved the forecasts." Climate scientists can now also benefit from the experience of project partner MeteoSwiss with this graphics card-based weather application, the first of its kind in the world.

Sharing experience and creating synergies

EXCLAIM also brings a whole range of benefits to MeteoSwiss and thus to Swiss weather forecasting in general. "In future, we will use the same model system for our simulations as the one on which EXCLAIM is based. This creates numerous synergies with climate research," explains Christof Appenzeller, Head of Analysis and Prediction at MeteoSwiss. Furthermore, the ICON (Icosahedral Nonhydrostatic) model system used by EXCLAIM and based on equilateral triangles also enables better simulation of physical processes such as cloud formation. And new types of observation – for example, from precipitation radar – can also be incorporated. This will further improve weather forecasts. But the close cooperation also makes economic sense, as Appenzeller points out: "Through EXCLAIM, as partners we can benefit from each other's expertise in the different fields of computer science, machine learning and model development. On its own, MeteoSwiss could not build up this knowledge to the same extent and in the same depth."

▼ The first cabinets of the "Alps" research infrastructure have already been installed.

CSCS/Marco Abram; Roman Keller; Colourbox

Gradual implementation

The project is being implemented step by step with four scientific use cases of increasing complexity. The first and simplest applications are referred to as Aqua Planet simulations. They depict the Earth's climate on a sphere, including large-scale atmospheric circulation. Their resolution will be gradually refined from 10 km to 1 km. Among other things, this makes it possible to analyse the feedback effect of clouds on the buoyancy caused by solar radiation. From the perspective of the overall project, these comparatively simple simulations are ideal for checking the accuracy, consistency and efficiency of the models during the changeover to the new software basis.

At the second level of complexity, global and uncoupled simulations of clouds and convection currents are carried out. The aim is to better understand the dependence of cloud formation on boundary conditions such as sea surface temperature.

The third and last tier of complexity is represented by global simulations that fully couple the atmosphere, oceans, sea ice and land surface. The main scientific focus is on extreme weather events over the oceans, such as tropical cyclones or marine heatwaves, and their extension to land regions.

Finally, the fourth use case focuses on regional and local climate scenarios for Europe. They are a basic prerequisite for predicting the nature and frequency of extreme weather events. For this purpose, an implementation limited to Europe is being developed based on the uncoupled global system. With a resolution of one kilometre, it will enable very fine-scale modelling for the Alpine region.

Benefits for science and society

While EXCLAIM will enable ETH Zurich to further expand its position as a leading university for climate and meteorological sciences, the results of the simulations will also provide Switzerland and other European countries with important foundations on which they can make fact-based decisions concerning the most effective and efficient ways of adapting the state, economy and society to climate change.

"Through EXCLAIM, as partners we can benefit from each other's expertise in the different fields of computer science, machine learning and model development."

Christof Appenzeller, Head of Analysis and Prediction at MeteoSwiss

◄ The HiLo unit sits on the top platform of the NEST research and innovation building on the Empa campus in Dübendorf, Switzerland.

HILO

BETWEEN PAST AND FUTURE

It features an intricate, curved concrete roof and self-learning building technology: the innovative HiLo unit in the NEST research building of Empa and Eawag in Dübendorf is an impressive sight. The opening ceremony for the cutting-edge structure was in October 2021. HiLo stands for "High Performance – Low Emissions" and is packed full of ETH research.

The structure was inspired by medieval construction methods and planned and built using state-of-the-art computerised design and fabrication techniques. A team of scientists led by ETH professors of architecture Philippe Block and Arno Schlüter is working with industry partners to examine how lightweight structures and efficient building methods can be combined with intelligent and adaptive building systems to reduce emissions in the construction industry.

HiLo is the eighth module of the experimental NEST building. Scientists and industry partners can use this modular research and innovation building to test and develop new construction and energy technologies in the form of temporary building modules under real-life conditions.

► The HiLo NEST unit:

PATHFNDR

PATHWAYS TO THE ENERGY TRANSITION

What will an efficient, flexible, resilient, competitive and sustainable Swiss energy system look like in 2050? This question is being examined by researchers from the PATHFNDR consortium. It was launched in May 2021 and brings together eight research partners – ETH Zurich, EPFL, Paul Scherrer Institute, Empa, Zurich University of Applied Sciences, Lucerne University of Applied Sciences and Arts, University of Geneva and Delft University of Technology – and 25 national and international cooperation partners. It is headed by André Bardow, Professor for Energy and Process Systems Engineering at ETH Zurich, and his deputy, Christian Schaffner, Executive Director of the Energy Science Center of ETH Zurich.

PATHFNDR develops scenarios, planning and operation tools, and innovation strategies for integrating renewable energies into Switzerland's future energy system. The focus is on flexibility and sector coupling; in other words, how different stakeholders and technologies at different levels – from Switzerland as a whole to individual buildings – need to work together to enable the energy transition by 2050. PATHFNDR is sponsored by the Swiss Federal Office of Energy's SWEET programme (Swiss Energy research for the Energy Transition).

dTIP

NEW PLATFORM FOR CLINICAL TRIALS

As part of its focus on medicine, ETH Zurich has launched a new technology platform for clinical trials. With the digital Trial Intervention Platform (dTIP), it is further expanding its clinical infrastructure and standardised procedures, and providing support for the implementation of complex clinical trials for researchers and spin-offs. Services are also offered relating to the digitisation of research projects and for dealing with regulatory issues. dTIP is spread across two locations: studies are currently being carried out at the Kantonsspital Baden and in future will also be conducted in the new GLC development and laboratory building in Zurich.

▲ dTIP will support researchers and spin-offs in carrying out clinical trials.

Already around a third of professors at ETH Zurich are tackling health-related subjects in their research. The main activities are in basic research relevant to medicine, such as diagnostics, medical technologies and the development of bioactive substances. The platform will also draw on a network of clinical partners and form project-based alliances to address specific study needs.

The activities are supported by the Wellcome Trust, a foundation that promotes medical research.

► Technology platform:

SUCCESS IN THE LAST ROUND

Provisionally for the last time, researchers were able to apply through ETH Zurich for the prestigious grants awarded by the European Research Council (ERC). Thirteen researchers were successful.

ADVANCED GRANTS

Professor Ulrike Lohmann,
D-USYS, will carry out a project to investigate the microphysical processes in winter that lead to precipitation in clouds containing ice. This will involve injecting ice nucleating particles from a drone into supercooled stratus clouds. The aim is not only to quantify the consequences of such artificial weather modification but also to improve weather prediction models and precipitation forecasts.

Professor Frank Schimmelfennig,
D-GESS, plans to examine European border demarcations in his project and review common theories about them. While many theories of European integration focus on developments internal to the EU, Schimmelfennig starts from the observation that the EU's recent crises – from the euro crisis to the coronavirus pandemic – originated outside the EU's borders and that European integration is coming under pressure from geopolitical shifts.

FINAL EVALUATION

Two ERC Advanced Grants were obtained as part of the Horizon 2020 research programme, in which Switzerland participated. ETH Zurich received around 6.6 million Swiss francs as a result. Switzerland will not be involved in the successor programme Horizon Europe for the time being. However, in 2021, the ERC evaluated the submitted projects for the final time. Provided the 11 successful grantees carry out their projects at ETH, they will receive the funding, worth a total of around 17 million Swiss francs, from the Swiss State Secretariat for Education, Research and Innovation (SERI). The Swiss National Science Foundation has set up a replacement programme for the future. However, this lacks the competitive character of the grant award at pan-European level, which is of central importance for researchers.

STARTING GRANTS

Professor Elliott Ash,
D-GESS, will develop systems for administering justice that are based on artificial intelligence and able to measure fairness. Such systems can detect when judges are biased or politically influenced. By helping judges reach decisions, the systems could lead to fairer judgements.

Dr Katharina Gapp,
D-HEST, aims to investigate a new mechanism and describe how environmental influences to which humans and animals are exposed can affect future generations of children and grandchildren. Scientists have already described several of these epigenetic inheritance mechanisms. The mechanism being investigated by Dr Gapp is one that has not yet been described in detail and is mediated by stress receptor proteins.

Dr Andreas Güntner,
D-MAVT, wants to develop a new generation of highly sensitive nanotechnology-based sensors that measure volatile molecules, even at low concentrations. This will involve the use of new manufacturing methods and materials. The sensors could one day be built into smartphones to analyse the ambient air or detect toxins.

Professor Manuela Hospenthal,
D-BIOL, will carry out a project to decipher the mechanisms of natural transformation. In molecular biology, natural transformation refers to the phenomenon whereby bacteria are able to take up DNA from the environment and integrate it into their genome.

Dr Matthias Leese,
D-GESS, will explore how European border control and law enforcement authorities handle their data and their awareness of data quality issues. He will also develop recommendations for improving the quality of data in Schengen and Europol information systems.

Dr Mickael Perrin,
D-ITET, will develop a novel, improved thermoelectric generator in which the electrical circuit is decoupled from the thermal circuit. A thermoelectric generator uses temperature differences to generate electricity.

Dr Paolo Sossi,
D-ERDW, is studying the formation of planets from dust grains to complex celestial bodies. In his project, he will simulate miniature planets and their atmospheres in the laboratory and examine them in the form of magma spheres floating on gas streams.

Professor Julia Vogt,
D-INFK, will develop new machine learning methods and applications for decision support in medicine that are more highly trusted by physicians than current systems. Specifically, she plans to develop applications to detect heart defects in newborns and to predict diabetes in children at an early stage.

Professor Ce Zhang,
D-INFK, is also interested in the topic of trustworthy artificial intelligence. Whereas many findings on trustworthy AI currently relate to limited subsystems, Zhang wants to extend these to complex systems such as those commonly found in everyday life.

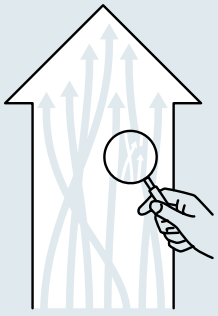
Professor Pierrick Bousseau,
D-MATH, will explore mathematical conjectures from theoretical physics. However, he will not be doing this at ETH Zurich, but will move to the Laboratoire de Mathématiques d'Orsay at the CNRS in France.

Materials scientist Dr Mengxia Liu
was working as a postdoctoral researcher at the University of Cambridge until the end of 2021. She successfully obtained an ERC Starting Grant with the support of ETH Zurich. However, she has since accepted a professorship at Yale University and therefore will not be taking up the ERC funding.

RESEARCH OVERVIEW

WHAT ARE ETH'S RESEARCH PRIORITIES?

The four strategic action areas of ETH Zurich's Strategy and Development Plan 2021–2024, namely Health and Medicine, Data and Information, Responsibility and Sustainability, and Materials and Manufacturing, are directly reflected in its research. Important structural developments took place in all fields in 2021. ETH Zurich derives its high innovation potential from excellent basic research and promotes research across disciplines.



Health and Medicine

ETH Zurich is steadily expanding its activities in the field of medical research. One goal is to improve the translation of new research results into medically relevant applications through closer collaboration with hospitals, initiatives such as the Lymphoma Challenge, or the establishment of MedLab Fellowships. In 2021, ETH launched a new technology platform for clinical trials, the digital Trial Intervention Platform (dTIP), to support researchers in planning, submitting and conducting complex clinical trials (see page 27).

Seven new professorships were created in this area during 2021 in fields such as research into new protein functions and protein therapeutics, and antibiotic resistance.

Data and Information

An example of the development of this priority area is the growth of the ETH AI Center, which was founded last year and now includes almost one fifth of all professorships from various ETH departments. The expansion of quantum science and quantum technology will be consistently pursued, for example, through the Quantum Computing Hub, a joint centre of ETH Zurich and PSI for the development of quantum computers.

Two new professorships were created in 2021, one in computational physics and the other in the formation and evolution of planetary systems and moons, mainly using computer simulations.

Responsibility and Sustainability

New initiatives were launched in 2021 – some in association with other research institutions – that take an interdisciplinary approach to responsibility and sustainability. The Center for Sustainable Future Mobility, with members from eight departments, aims to develop the foundations for a sustainable transport system. Within the Center for Climate Systems Modeling (C2SM), the EXCLAIM project is investigating how changes in the atmosphere affect weather systems and hence people's actual living conditions (see pages 24–26). And the PATHFNDR project is looking at how Switzerland's future energy system will have to be transformed in order to incorporate a much larger share of renewable energy (see page 27).

ETH's strong commitment in this area is reflected in the appointment of eight new professorships in fields including sustainable agriculture and nutrition, climate finance and policy, and improving energy efficiency.

Materials and Manufacturing

New lightweight construction methods are being researched in the field of Materials and Manufacturing with the aim of making buildings more sustainable and efficient. One example is the HiLo unit in the experimental NEST building on the campus of the two research institutions Empa and Eawag in Dübendorf (see page 27). Sustainability principles are also behind the ongoing development of building projects using 3D-printed concrete, as construction requires fewer raw materials overall and the concrete elements can be taken apart for dismantling and rebuilding elsewhere. In 2021, the go-ahead was given for the construction of a 23-metre-high tower built by robots and made of 3D-printed concrete in Mulegns, a village on the Julier Pass. A 3D-printed concrete footbridge named Striatus was also unveiled at the Venice Biennale of Architecture.

Two new professorships were created in the strategic action area of Materials and Manufacturing, for example, in the 3D printing of architecture and the exploration of efficient and eco-friendly building processes.

Active collaboration between science, business and society is essential for creating prosperity and tackling the major issues of the present and the future. It is not only the pandemic that requires joint action, but also challenges such as climate change or the loss of biodiversity. Collaboration is also the launch pad for innovation, which comes from combining academic knowledge with entrepreneurial thinking and the market proximity of industry partners. Science does not take place in a vacuum, but also needs continuous dialogue with society.

INDUSTRY AND SOCIETY

ETH Zurich / Oliver Bartenschlager

GOING ALL OUT FOR VACCINES

When Lonza was urgently seeking skilled staff in April 2021, one thing soon became clear to Professor Wendelin Stark and many members of his group: COVID-19 vaccine production was the top priority. A short time later, 15 people from the Functional Materials Laboratory – from students to professors – dropped everything and travelled to Visp in the canton of Valais for an assignment lasting several months. Among them was doctoral student Anne Lüscher. In total, 24 ETH members were temporarily engaged in vaccine production at Lonza in 2021.

WORKING TOGETHER ON INNOVATIVE SOLUTIONS

ETH Zurich works closely with industry – large companies, SMEs and start-ups. It aims to use new knowledge and innovative technologies derived from basic research in response to specific problems encountered in the real world. The following examples demonstrate the potential benefits for both sides.

By Christoph Elhardt

ETH Zurich/Oliver Bartenschlager

A remote-controlled excavator that can be used in places too dangerous for people. Smart textiles that collect important health data. Or new materials that store energy faster and more efficiently than ever before. These were just three of the many new technologies presented at this year's Industry Day at ETH Zurich. After last year's event had been held only virtually due to the COVID-19 pandemic, this year almost 400 visitors from industry and business found their way to ETH.

During numerous talks and at around 70 exhibition stands, ETH researchers and spin-offs presented current projects and new products and met with a positive response: "The event is a unique opportunity to learn about new technologies and make potential contacts for partnerships. Meeting people face-to-face is essential," says Evelyn Wolfram from the company Ricola, commenting on the day.

Transferring relevant knowledge to industry

For ETH, Industry Day is primarily about presenting scientific findings that could be significant for industry and attracting industry partners for research projects: "As a publicly funded university, it is our job to pass on relevant knowledge and innovative technologies derived from basic research to business and society. At the same time, we benefit from the experience made by industry," says Vanessa Wood, Vice President for Knowledge Transfer and Corporate Relations, who opened the event.

Besides Industry Day, there are numerous other ways for ETH to find the right research partner – be it a large company, an SME or a start-up. The Industry Relations department acts as a point of contact, evaluating collaboration partners and organising meetings with companies. Urs Zuber heads the department: "The best opportunities for collaboration arise from situations where you can link new knowledge from fundamental research with a specific problem encountered in the real world," says Zuber.

Novel ways to cast concrete

To take an example from last year: SACAC, a family-owned SME specialising in the production of concrete elements, teamed up with Fabio Gramazio and Matthias Kohler's Chair of Architecture and Digital Fabrication and Robert Flatt's Chair of Physical Chemistry of Building Materials. "We were unhappy with our current formwork system, as it is expensive and inflexible. With ETH, we found a partner who can help us modernise the production of concrete supports and thereby reduce delivery times and costs," explains Lukas Unteregger, project manager at SACAC.

▲ Industry Day 2021 in September attracted 400 visitors from industry and business.

For Ena Lloret-Fritschi, who supervised the project on the ETH side, the biggest challenge was to scale up the robot-assisted slip-forming technology developed in the laboratory for industrial production. "We had to adapt the concrete recipe and mixing process according to SACAC's standard, and this taught us a lot about the industrialisation of our technology," says the ETH researcher.

The partnership also had tangible benefits for SACAC: "Together we have developed a new concrete mix that allows us to strip the formwork twice as fast," Unteregger explains. "This greatly increases productivity and flexibility." Although there is still some way to go before it is ready for the market, this is an important optimisation step for SACAC. The family business was also able to gain valuable experience with a digitally controlled concrete pump, which is now also being used for other applications. The industrialisation of the digital concreting process developed at ETH is to be further advanced in a follow-up project.

Green gases for an eco-friendly power grid

To insulate high-voltage switchgear and thus increase the safety of high-voltage lines, a gas called SF6 is used worldwide. If small amounts of this gas escape from the switchgear, which is not entirely preventable even with the greatest care, it produces a strong greenhouse effect. To avoid this and develop more sustainable insulating gases, Christian Lindner from Axpo, one of Switzerland's leading utilities, approached ETH Professor Christian Franck. "Our goal was clear: to reduce the environmental impact of our power grid," says the Axpo manager.

On the initiative of Christian Franck from ETH's High Voltage Laboratory, a research project on alternative insulating gases was launched, jointly funded by 18 industry partners and power grid operators. "Our aim was to make an unbiased comparison of different insulating gases," says the ETH professor. The numerous experimental trials also focused on a gas mixture already available on the market, which proved to be effective and sustainable: "The greenhouse gas potential of this alternative gas mixture is at least 98 percent lower than that of SF6," says Franck.

The joint research project led to a number of positive developments: "Due to the neutral and unbiased information provided by ETH, more and more suppliers are willing to use green alternatives," explains Axpo engineer Lindner. Furthermore, we now know much more about the properties of sustainable insulating gases. The research project, which is jointly supported by industry and ETH, is thus making an important contribution to a more eco-friendly power grid.

ETH as a magnet for tech companies

Perhaps the most important channel for the transfer of knowledge to the economy continues to be the recruitment of graduates. In recent years this has proved especially true of the technology sector, where ETH has become a magnet for large tech corporations such as Google, Microsoft, IBM, Facebook, Hitachi, Amazon and, more recently, Zalando. Alongside Google and Facebook, which are both looking to expand in Zurich, Zalando in particular made headlines last year.

At the end of 2021, the online fashion retailer decided to establish a new technology centre in Zurich's Prime Tower. One reason for this was the ETH spin-off Fision, which Zalando acquired in 2020. Fision develops 3D software for virtual changing rooms with the aim of making online shopping more customer-friendly. Some 150 experts – many of them ETH graduates – will further develop this technology in Zurich. ETH is responding to the growing demand for IT specialists by expanding relevant study programmes.

► ETH Industry Relations:

◄ In November, Federal Councillor Viola Amherd gave a lecture at ETH on the subject of a secure Switzerland and what we will and must do to achieve it.

CONSTRUCTIVE DIALOGUE

A DIRECT LINE TO POLICYMAKERS

Science is needed more than ever before to meet the increasingly complex challenges facing our society. With its wide array of skills, ETH Zurich is ideally placed to support the world of politics and administration in finding solutions and making decisions. During the pandemic, the Swiss National COVID-19 Science Task Force has been able to rely on the significant contributions made by ETH. In 2021, ETH took things a stage further by investing in constructive relations with the authorities. A contact person has been appointed to deal with their questions and concerns. Professional dialogue was further developed with various offices of the Federal Administration, such as the Federal Chancellery.

Numerous representatives from the federal government also visited ETH in 2021 to gain a first-hand impression. The Environmental Committee and the Sub-Committee of the National Council's Finance Committee, which is responsible for the ETH Domain, were welcomed to discussions at ETH. Federal Councillors Viola Amherd and Simonetta Sommaruga gave keynote speeches on security and climate change issues at ETH. As part of a fact-finding tour, the "Centre" group of the Federal Parliament also paid a visit to ETH and discussed the topic of cyber security.

PARTNERSHIP

CLARIANT SUPPORTS CATALYSIS RESEARCH

ETH Zurich and specialty chemicals company Clariant entered into a strategic partnership in February. For an initial period of ten years and with funding of ten million Swiss francs, Clariant will sponsor research in the area of catalysis and sustainable chemistry. The aim is to improve our understanding of catalyst properties from nano- to macroscale level and their performance. Clariant will also work with the ETH Zurich Foundation to support projects in basic chemical research, funding talented researchers and students.

ETH is at the forefront of catalysis research. Detlef Günther, Vice President for Research, explains: "The new research collaboration with Clariant opens up great opportunities for our scientists and students to expand their knowledge in catalysis and benefit from first-hand expertise in the industrial application of novel technologies." Clariant describes the research collaboration as an important milestone: "This partnership underscores our commitment to fostering innovation in order to develop groundbreaking products and solutions that add value for people, industries and the environment."

OLMA

A FUN LOOK AT AGRICULTURAL SCIENCE

A model of a cow's methane-producing stomach, a tricky flying challenge over a miniature research field and an agricultural policy balancing act: ETH Zurich showed its playful side at the Olma food and agriculture fair. Under the motto "Where the future begins – research for sustainable agriculture", ETH presented interactive exhibits that introduced key research questions relating to crops, livestock and agricultural policy.

The "Ruminant Simulator" allowed visitors to test which feedstuffs are best for reducing methane emissions from cows. The flying challenge offered more technically minded visitors the opportunity to pilot a small drone for themselves and learn how smart flying machines document plant growth in the field. Other visitors, including Swiss President Guy Parmelin, tried to balance the different components of the food system by playing "Agricultural Policy Jenga". The games were accompanied by the Rowesys weeding robot, a hexacopter and the ETH spin-off SmartBreed from the ETH Student Project House. Members of the public showed particular interest in their fully automated insect breeding box for sustainable poultry feeding.

▼ Guy Parmelin (Swiss President in 2021) and ETH President Joël Mesot at Olma.

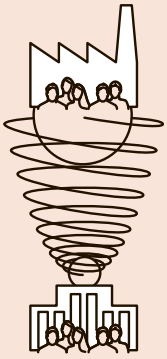
► ETH Zurich at Olma:

ETH Zurich / Alessandro Della Bella; Simon Schmid, smith-art.ch

OVERVIEW OF INDUSTRY AND SOCIETY

DIALOGUE THROUGH PARTNERSHIP

Sustainable, broad-based solutions for the future can only be found through collaboration with industry, support for entrepreneurship and dialogue with society.



ETH Zurich has set itself the goal of transferring the fruits of its research to the economy and society for the benefit of all. To this end, it relies on the targeted support of entrepreneurial talent and on close working relations with its industry partners. For example, the technology transfer office, **ETH transfer,** alone concludes around one thousand new contracts with third parties each year, most of them industry partners.

The **Pioneer Fellowships** help entrepreneurial ETH graduates convert research ideas into innovative products and services. There are currently 15 Pioneer Fellows in the funding programme, who benefit from the support of their professorships and the Innovation & Entrepreneurship Lab (ieLab). Since 2010, a total of 110 scholarships have been awarded, and 69 spin-offs have resulted to date.

One of the successes of **ETH spin-offs** is demonstrated by the amount of venture capital invested in the young companies. In 2021 ETH spin-offs received around 400 million Swiss francs through various financing arrangements, among which the financing rounds of Bright Peak Therapeutics (96 million Swiss francs), GetYourGuide (87 million Swiss francs) and Planted Foods (36 million Swiss francs) stand out in particular. Several spin-offs passed into new hands in 2021. For example, a group of US investors bought AutoForm, a company founded from within ETH in 2005, for an estimated 1.8 billion Swiss francs. Zurich Instruments AG, founded in 2008, and the two life science start-ups deepCDR and Inositec were also acquired, the latter by Swiss company Vifor Pharma. Furthermore, spin-offs won various prizes such as the W.A. de Vigier Award (dimpora, Lumiphase), the Top 100 Swiss Startup Award (Planted Foods) and the Swiss Economic Award (also Planted Foods).

The **Spark Award** celebrated its 10th anniversary. The award for best invention of the past year went to a team led by Professor Paolo Ermanni for a novel manufacturing process for recyclable composite materials.

The ETH-led **ESA Business Incubation Centre Switzerland,** which supports Swiss start-ups related to space technologies, has been extended for another five years (2022 to 2026) due to its great success. In its first five years, more than 50 young high-tech companies were made ready to explore the space market or helped to apply space technology on Earth. To date, the start-ups have raised more than 200 million euros in third-party funding and created over 500 jobs in Switzerland.

The pandemic has shown us the crucial importance of dialogue between science, politics and society. As experts, scientists not only provide information to the media and the public. They also play an important role as members of the **Swiss National COVID-19 Science Task Force.** Parliament, the executive and the authorities also rely on scientific expertise when it comes to shaping climate, energy and environmental policy. It is up to policymakers to draw the necessary conclusions from fact-based scientific arguments and use them to draw up concrete guidelines. The problems are often so complex and fast-moving that there are no simple solutions, and science must constantly adapt to changing situations. Controversies around vaccination and compulsory certification requirements have exposed conflicts that also concern science. Here, it is important to follow tried-and-tested as well as new paths in order to create trust and strengthen a dialogue based on mutual respect.

Opportunities for open debate are provided by public events at ETH such as the **Treffpunkt Science City,** the traditional **Climate Roundtable**, the **Global Lectures** or the **Scientifica** Zurich Science Days, which are jointly organised by ETH and the University of Zurich and in 2021 adopted the slogan “Synthetic naturally” (see page 11). The university receives valuable feedback from all these offerings, which also help the academic community to reflect on its own work.

HONOURS AND AWARDS

The many awards won by ETH scientists year after year demonstrate that the university offers the right environment for cultivating academic excellence. In 2021, ETH received a series of prestigious prizes, including the European Inventor Award and the Swiss Science Prize Latsis, and also presented its own awards, such as the Rössler Prize.

Keystone

ANNE LACATON RECEIVES THE 2021 PRITZKER ARCHITECTURE PRIZE

Anne Lacaton, Emeritus Professor of Architecture and Design at ETH Zurich, and her partner, Jean-Philippe Vassal, received the most prestigious international architecture award in March 2021: the Pritzker Prize. The jury praised the French architecture couple for their sustainable and social approach to building design. Lacaton and Vassal avoid the demolition of buildings and prefer to work with existing structures wherever possible. Their architect's office opened in 1987 and has already completed over 30 projects, the most famous being the extension and renovation of the Palais de Tokyo arts centre in Paris.

► Pritzker Prize:

AWARD-WINNING ETH RESEARCHERS

In 2021, many scientists from ETH Zurich were again honoured with prizes for their outstanding achievements. We report on four award-winning ETH researchers.

By Claudia Hoffmann

European Patent Office; Daniel Rihs; Alessandro Crinari

EUROPEAN INVENTOR AWARD

STORING DATA FOR THOUSANDS OF YEARS

Digital storage media such as hard disks or servers only have a limited service life of around ten years. However, the exponential growth of data volumes is creating a huge demand for more long-term and reliable storage media. Two ETH professors of chemical engineering, **Robert Grass** and **Wendelin Stark,** have developed a very promising solution using DNA encapsulation to store massive amounts of information for thousands or even millions of years. The European Patent Office has honoured them with the European Inventor Award for their innovative method.

The code of the genetic material DNA consists of a sequence of four molecules, abbreviated to the letters A, T, C and G. To store the text of a book, for example, this first has to be translated into digital code, which is in turn transposed to DNA code and synthesised as artificial DNA – a medium with enormous storage capacity: a tiny amount of DNA could store Wikipedia's entire body of knowledge.

However, DNA molecules are easily destroyed by the corrosive forces of nature. To solve the problem of durability, Grass and Stark drew inspiration from fossils: when encapsulated in old bones or amber, DNA remains stable, safely stored over hundreds of thousands of years. Through exhaustive laboratory tests the researchers discovered a material that is just as effective at protecting the DNA: they encapsulated the DNA in tiny glass beads with diameters 10,000 times thinner than a sheet of paper. To then retrieve the information, fluoride ions are used to dissolve the glass without damaging the DNA in the process.

Stark and Grass, both professors at the Institute for Chemical and Bioengineering, have filed patents for their invention and founded the ETH spin-off Haelixa AG. The company markets the glass-encapsulated DNA for another field of use: as the tiny spheres are practically invisible and the contents cannot be altered, they are also suitable for forgery-proof marking of goods such as textiles or diamonds.

SWISS SCIENCE PRIZE LATSIS

DEVELOPING NEW CANCER THERAPIES

When **Nicola Aceto** decided to publish the results of his pioneering work, the research community was initially sceptical, as the findings did not concur with existing dogmas. Aceto is Associate Professor of Molecular Oncology at the Department of Biology, where he studies the formation of cancer metastases. For a long time the accepted view was that the malignant offshoots derived from individual cancer cells. These break away from the original tumour and spread through the bloodstream to other parts of the body, where they implant themselves and grow into metastases. In the blood samples of cancer patients, however, Aceto discovered not only individual cells, but clusters of circulating tumour cells (CTCs). He had a hunch that this could be an important discovery. And he was right: the cancer developed more quickly in patients displaying these CTC clusters than those who only had individual tumour cells in their blood. Experiments with mice also showed that metastases develop fifty times more frequently from such cluster cells than from individual tumour cells. The CTC clusters also split more often and stay lodged in narrow blood vessels, making it easier for them to embed themselves in new locations.

The Italian-born scientist has been honoured with the Swiss Science Prize Latsis in recognition of his research. His findings are incredibly important for cancer treatment: metastases are responsible for 90 percent of all cancer-related deaths worldwide. Aceto has adopted a novel approach to prevent their formation: using drugs to get the cell clusters to break down into individual cells and thereby render them less dangerous. To this end, he and his team have tested several approved active substances and already found a very promising initial candidate, which is currently being tested on breast cancer patients as part of a clinical trial. In future Aceto, who has already filed ten patents, will push ahead with the development of diagnostic tools in his new lab installed on the Hönggerberg campus.

ERNST JUNG MEDAL FOR MEDICINE

A LIFE'S WORK RESEARCHING IMMUNITY

Even at the age of 70, **Antonio Lanzavecchia's** passion for research is as strong as ever. His main interest is the human immune system, whose workings he finds truly fascinating. Professor Lanzavecchia is considered one of the world's leading immunologists and is currently based at the National Institute of Molecular Genetics in Milan. Over the course of his career he has made several groundbreaking discoveries that have played a key role in the development of vaccines and therapies based on antibodies. For his life's work, he was awarded the Ernst Jung Gold Medal for Medicine in recognition of his outstanding contribution to medical progress.

Lanzavecchia qualified in paediatrics before specialising in infectious diseases. Since the early 1980s the Italian-born scientist has been active in research at several Swiss institutions. In 2000 he established the Institute for Research in Biomedicine in Bellinzona and was Professor of Human Immunology at ETH Zurich from 2009 until retiring as Emeritus Professor in 2017. Among other things, Lanzavecchia discovered a mechanism whereby certain immune cells work together in the body to form antibodies – a fundamental discovery that marked a big step forward in immunology research.

Antibodies play a key role in defending the body against pathogens such as viruses or bacteria. Lanzavecchia and his team developed methods to isolate effective antibodies that neutralise various viruses such as Ebola, Zika or SARS-CoV. These antibodies can be used for prophylactic or therapeutic purposes. Lanzavecchia also analyses the structure and properties of antibodies so as to design efficient novel vaccines on this basis. One of his aims is to use this approach to improve the efficacy of an existing malaria vaccine.

Keystone

LEOPOLDINA AWARDS
CARUS MEDAL

USING MATHEMATICS TO FIGHT THE PANDEMIC

When **Tanja Stadler** is asked to describe her experiences over the past two years in just a few words, she says: overwhelming, but highly informative. As well as her usual research, the 40-year-old ETH professor has played a key role in measures to control the coronavirus pandemic, which also gave her a prominent media presence. Stadler is a member of the Swiss National COVID-19 Science Task Force and took over as its president in August 2021. Each day, her Computational Evolution research group at the ETH Department of Biosystems Science and Engineering (D-BSSE) in Basel calculates the Reproductive number, or R value, as an indicator for mapping the course of the pandemic. Stadler also heads a consortium for sequencing the DNA of SARS-CoV-2, which has enabled her to identify several new variants of concern at an early stage.

The mathematician specialises in biological modelling and has been researching infectious diseases for some time. During the 2014 Ebola epidemic in West Africa, for example, she and her team calculated important epidemiological indicators, such as unrecorded cases, incubation period and infectious phase. Researchers worked out these values using mathematical-statistical models based on "phylogenetic trees". These are in turn produced on the basis of DNA analyses of different virus strains that show how the virus changes genetically over time.

The same methods can also be applied to completely different fields that have also attracted Stadler's attention, such as the evolution of cell lines, animal species or even language. Stadler has already won multiple awards for her innovative research. In 2021 she received the Carus Medal from Germany's National Academy of Sciences Leopoldina, which honours important research contributions from young scientists. Stadler is keen to continue to apply her expertise at the interface between science and society.

SPECIAL AWARDS TO ETH MEMBERS

RÖSSLER PRIZE

Professor Andreas Krause, Professor of Computer Science, received ETH Zurich's most lucrative award of 200,000 Swiss francs. Krause is one of Europe's leading researchers in the field of machine learning. His goal is to understand how machines can be made to learn as efficiently as humans. To do so, he develops programs that do not simply learn using a predefined set of data, but decide for themselves which information they need in order to do better in a set task. These programs are known as learning agents and have immense potential for uses in many other areas, such as robotics or medicine.

ETH ZURICH LATSIS PRIZE

Professor Stanisa Raspopovic, Professor at the Institute of Robotics and Intelligent Systems, has been honoured for his work on linking prostheses to a patient's sensory nervous system. Conventional prostheses provide no feedback on the wearer's contact with the ground, which makes walking very tiring and can cause falls. This is not the case with the innovative bionic system: tactile sensors on the sole of the prosthetic foot provide feedback to electrodes implanted in the wearer's thigh. With the help of special algorithms, the nerves are stimulated so that the wearer is able to sense when the prosthesis is touched. Studies have shown that this not only makes walking safer and easier, but also demonstrate that stimulating the nerves can even help to alleviate phantom limb pain.

CHORAFAS PRIZE

Chemist **Dr Kristýna Kantnerová** and mathematician **Dr Xavier Fernández-Real** were honoured for their outstanding dissertations. At Empa and ETH Zurich, Kantnerová developed a novel analysis method that can be used to differentiate different isotope forms of the greenhouse gas nitrous oxide (laughing gas, N_2O). This provides a better understanding of the lifecycle of nitrous oxide and how to contain emissions in the long term. Fernández-Real completed his doctorate in the research group of Alessio Figalli, a recipient of the Fields Medal. He investigated mathematical models that describe the behaviour of boundary surfaces, for example, at the transition from ice to water. Fernández-Real is continuing his research at EPFL.

LOPEZ-LORETA PRIZE

Dr Nicole Stoffel, a postdoctoral researcher at ETH Zurich's Laboratory of Human Nutrition and the University of Oxford, has won the prestigious Lopez-Loreta Prize totalling one million euros for her research into the effect of iron deficiency on vaccinations. Around forty percent of children world-wide suffer from anaemia caused by lack of iron. In a retrospective study in Kenya, Stoffel managed to prove that a measles vaccination is up to five times less effective in young children suffering from iron deficiency compared with children showing normal iron values. If children receive iron as a dietary supplement, the protection offered by the vaccine is much higher. Stoffel will use the prize money to conduct further clinical trials and also research the underlying molecular principles.

► Honours and awards to ETH members:

► ETH Day 2021:

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 doctorates in 2021:

Professor Aviv Regev, Executive Vice President & Global Head, Genentech Research and Early Development, for inventing groundbreaking bioinformatic and experimental methods for investigating cellular systems.

HONORARY COUNCILLORS

The title of honorary councillor is awarded to individuals who foster key scientific activities or fields of work at ETH, or who support the university as a whole. The following people were appointed honorary councillors of ETH Zurich in 2021:

Dr sc. nat. Germaine J.F. Seewer, Commander of the Armed Forces College/ Deputy Chief of Training and Education Command, for her extraordinary personal commitment to the promotion of young talents at ETH Zurich and for being an inspiring role model, especially for women who aspire to a career in traditionally male professions.

Dr sc. techn. Suzanne Thoma, CEO BKW AG, for her exceptional personal engagement in promoting teaching and research at ETH Zurich, especially in the fields of energy and physics, and fostering talent.

HUMAN RESOURCES AND INFRASTRUCTURE

DISCRIMINATION. SEXUAL HARASSMENT. BULLYING. THREATS AND VIOLENCE.

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 almost 13,000 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, which is why it expects a lot from its employees. As a responsible employer, it offers attractive terms of employment and good working conditions, which it continuously seeks to improve through various measures.

AT ETH ZURICH WE WILL NOT TOLERATE:

A CULTURE OF MUTUAL RESPECT

Respect is once again a topic at the very top of ETH Zurich's internal agenda. With the new campaign "Stand up for respect", the university is encouraging every member of its community to step in and take action as an "upstander" whenever they witness inappropriate behaviour. "Types of behaviour such as bullying, harassment or discrimination, as well as threats and violence, have no place in our community," stresses ETH President Joël Mesot. A series of special "Respect Events 2021" during the course of November 2021 accompanied the campaign.

► Respect campaign:

You can find more information and some important contacts at

www.ethz.ch/**respect**

ETH GAUGES THE MOOD OF EMPLOYEES

Over 5,000 ETH employees took part in the employee survey 2021. One particularly encouraging result is that 88 percent of staff describe their level of job satisfaction as high or very high. But there are also areas for improvement. The Executive Board has identified concrete measures to address these shortcomings.

By Mona Blum

The university conducted its fifth employee survey from 23 March to 23 April 2021. The purpose of this anonymous online survey is for the ETH Executive Board to assess how satisfied university staff are with their employer and their work situation. The last employee survey was held in 2016.

The 2021 survey was sent out to a total of 9,792 professors and technical/administrative staff, of whom 5,074 responded, equivalent to a 51.8 percent rate of return. The findings have a direct influence on the university's future development.

High scores for sense of belonging and job satisfaction

Overall, the survey results are positive and show some improvements since the last survey in 2016. For example, 88 percent of respondents expressed a high or very high level of satisfaction with their work situation. It is also

▲ Whether working in logistics or in the lab: ETH offers thousands of staff a wide variety of jobs. This scores it points as an employer with strengths.

encouraging to note that ETH employees in all staff categories feel strongly connected to ETH Zurich (84 out of a possible 100 points). This is confirmed by good scores for identification (80 points), willingness to perform (87 points) and loyalty to the employer (85 points). Job satisfaction is also rated highly (75 points).

More personalised reports

Another positive trend can be reported this year: the 2021 survey yielded more than 620 detailed reports for teams and research groups that had at least five respondents.

These reports give supervisors valuable insights into the situation of their teams or groups. "These reports prompted many requests for a discussion of the survey results," says Lukas Vonesch, Head of Human Resources at ETH Zurich. "This shows that the survey has attracted plenty of interest and the results are taken very seriously."

Fallout from the pandemic

The survey also included a number of questions on the work situation during the pandemic. Here 59 percent said their work situation had improved or stayed the same during this period, while 42 percent felt it had slightly worsened. In particular, some employees said that working from home did not give them enough opportunities to interact with other employees on an interpersonal level (39 points). The pandemic had no negative impact on relations with direct supervisors: here the level of satisfaction has either been stable or risen for 83 percent of employees. Only 17 percent said they were less satisfied with their direct supervisor than before the pandemic.

Strengths

What aspects are ETH employees particularly satisfied with regarding their employer and their daily work? The survey results identify strengths mainly in these areas:

- **Respect and diversity:** Employees particularly value the fact that their direct supervisors treat them with respect (88 points). The overall culture of mutual respect at ETH Zurich is also rated as very good (82 points).
- **Work/life balance:** This gets a high score (82 points) – partly in view of the flexible working hours and opportunities for working from home (80 points), as well as childcare (80 points).
- **Leadership/supervision:** Both professors and supervisors receive positive feedback from their employees (81 points).
- **Work content/freedom of action:** Employees appreciate their work content (80 points) and their ability to apply their knowledge and skills (86 points). Positive feedback was also received on opportunities to implement their own ideas (79 points) and take on responsibility (82 points).
- **Appraisal interview/Objective-setting meeting/Status review/Personal development meeting:** 2021 results show that these types of meeting need to be held more regularly (78 points) than in previous years.

Overview of all especially positive survey scores.

Potential for improvement

The survey results show that employees identify many strengths in their work situation and their relationship with ETH as an employer. "Such positive feedback is obviously very encouraging and the Executive Board is very pleased to hear it," says Dr Julia Dannath, Vice President for Personnel Development and Leadership. "Even so, it's important that we now address those areas in particular where there is still potential for improvement." These areas include:

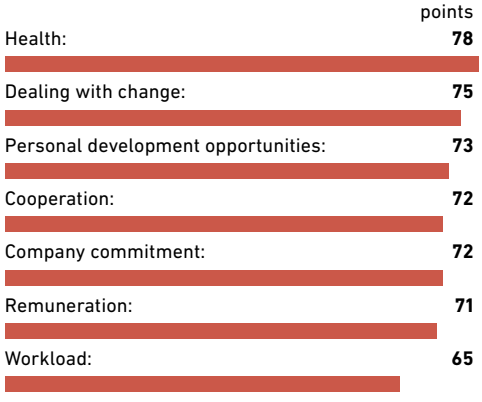
- **Opportunities for personal development:** Overall, employees are satisfied with the development opportunities available at ETH (73 points). There are some differences, however, among the different respondent categories: professors give development opportunities a score of 80 points, scientific staff 75 points, and technical/administrative staff 71 points. Senior assistants gave the lowest score of 69 points.
- **Dealing with change:** The score of 73 points for this aspect was slightly less than the 2016 survey

ETH Zurich/Alessandro Della Bella

(75 points). In particular, employees thought change was not implemented appropriately in some cases (64 points) and they were not well informed about changes taking place under the banner of rETHink, the organisational development project for the entire university (56 points).

- **Health:** The coronavirus pandemic has had various negative impacts at very different levels, including mental health. It is thus hardly surprising that employee scores for mental health were lower (78 points) than in 2016 (83 points). General physical health was rated the same as in 2016, with a score of 73 points.
- **Remuneration:** Overall, ETH employees rated their remuneration as good (71 points), although they give additional benefits a higher score (76 points) than when asked whether they think their salary is appropriate for the market (67 points).
- **Workload:** Workload is rated as rather high (65 points).

Overview of all areas with particular room for improvement.



"Positive employee feedback is very encouraging, but it's important that we now address those areas in particular where there is still potential for improvement."

Dr Julia Dannath, Vice President for Personnel Development and Leadership

ACTION AREAS AND MEASURES

After analysing all results, strengths and areas for improvement, the concrete findings were reviewed. To further optimise working conditions and the university's future development, the ETH Executive Board has identified the following four action areas, along with corresponding measures:

1. Action area:
Leadership, management/supervision and personal development
These areas have remained at a high level since the last survey and in some cases have even improved slightly. ETH Zurich aims to reinforce this strength with the following measures:

- Expand leadership and development support in line with the concept of lifelong learning
- Continue to promote status reviews and personal development meetings
- Facilitate smart working to encourage more flexible and mobile ways of working
- Promote digital literacy to develop employees' digital skills

2. Action area:
Diversity and respect
For the most part, employees feel that their supervisors treat them with respect. The following measures are designed to maintain and promote this culture of respect:

- Broaden the discussion on university culture to the entire ETH community, with special emphasis on diversity and equal treatment of all groups at ETH
- Draw up a diversity strategy
- Continue the internal campaign to raise awareness of the issue of respect
- Provide support for assistant professors in particular, with a special onboarding procedure

3. Action area:
Mental health
As employee health is particularly important to the university, ETH plans a number of measures to promote the psychological well-being of staff:

- Expand the existing contact, support and advice services with the addition of external specialist counsellors
- Offer first-aid courses regarding mental health and emotional well-being for supervisors and employees
- Hold regular information events to raise awareness among supervisors and staff about stress and available resources

4. Action area:
Dealing with change
To enable ETH members to understand, accept and manage change, the following measures are planned:

- Centrally driven changes will continue to be actively communicated and supported
- Changes that take place in academic and administrative departments should be more actively supported

These measures will now be introduced gradually and support provided for their implementation.

► Employee survey 2021:

◄ Members of the Office of Personnel Development and Leadership: Maximilian Buyken, Dr Betty Friedrich-Grube, Ernestine Hildbrand, Stephanie Hürttle, Dahlia Kälin, Dr Sara van Leeuwen.

OFFICE OF PERSONNEL DEVELOPMENT AND LEADERSHIP

FOCUS ON CORE TASKS

Dr Julia Dannath took up her post as Vice President for Personnel Development and Leadership (VPPL) in November 2020 and has headed up the VPPL staff unit since its creation one month later. VPPL started initially with 14 members and not only took on the classic staff roles but also assumed responsibility for aspects such as Faculty Services (supporting professors during their term of employment with ETH), equal opportunities and diversity, and conflict management.

The Executive Board domain of the Vice Presidency for Personnel Development and Leadership (VPPL) has had a new organisational structure since 1 January 2022, which has also brought greater clarity concerning its tasks and responsibilities. Issues such as conflict management were integrated into newly created departments within VPPL. "This restructuring allows us to concentrate our entire energy on supporting VPPL as an overall organisation and developing it further," says Maximilian Buyken, Chief of Staff at VPPL, in summing up the new tasks. "Our goal here is to provide optimal support for the VPPL leadership team, while helping communicate and promote themes such as diversity and lifelong learning – both within VPPL and across the university as a whole."

► VPPL staff unit:

INCLUSION AT ETH

REMOVING BARRIERS

The "Barrier-Free at ETH Zurich" programme got under way at the beginning of 2021. The master plan passed by the ETH Executive Board is designed to make the university as accessible as possible over the course of the coming years across all categories: construction, technology and organisation. The first measures have already been implemented.

In the Technology category, for example, Corporate Communications is testing and adapting barrier-free access to the Course Catalogue and other ETH apps and tools. The new signage, which has already been installed in some pilot buildings and is now being gradually introduced, meets the very latest accessibility requirements.

In the Construction category, the CHN building has been selected as the first pilot building for barrier-free conversion starting in 2022. The modifications planned include ramps, lifts and high-visibility markings on doors and steps. But building upgrades are not always the problem: to prevent furniture, movable displays or boxes becoming trip hazards, regular inspection patrols have been carried out since October to check all buildings for temporary hazards.

► Barrier-free ETH:

▼ Due to building automation and new energy systems, ETH buildings are tending to become increasingly complex: the new MLY cooling centre is a good example.

VPIN22 PROJECT

CLEARER FOCUS ON INFRASTRUCTURE SERVICES

The complex tasks required for installing, operating and continuously developing ETH's building and technical infrastructure are becoming increasingly challenging. To meet these challenges, a new department was created on 1 January 2022: Engineering and Systems. This incorporates sections from Facility Management, Real Estate and Services. At the same time, the existing departments of Facility Management and Services were reorganised. The entire reorganisation was completed without incurring any additional cost or loss of jobs.

The remit of the Engineering and Systems department is to provide integrated management of laboratory technology, teaching and research infrastructures, building technology and energy supply. The new department will assume system responsibility for what are technically increasingly complex structures – also highly sensitive and digitally networked in some cases. In addition, ETH wants to make significant progress in making the campus more sustainable, which requires modern technology and the relevant know-how.

The former Facility Management and Services departments have been renamed and will in future focus even more strongly on providing campus services on site. From now on, Campus Services (formerly "Services") will be responsible for campus mobility, print & publishing, events support and guided tours. The focus of Facility Services (formerly "Facility Management") will be on providing building-related services, such as maintenance and cleaning, to 35,000 ETH members. The last stage of the plan involves strengthening collaboration across all VPIN departments.

VPPL: ZVG; Eduardo Gisel

STAFF BY FUNCTION

ETH Zurich (consolidated)

Full-time equivalents (FTEs) at the end of 2021 (reporting date) or annual average	FTEs annual average						FTEs reporting date at y/e
					Increase		
	2020 Total	2021 Total	Women	International	Absolute	in %	2021 Total
Total staff [1]	**10,098.1**	**10,417.6**	**34.9%**	**58.0%**	**319.5**	**3.2%**	**10,706.5**
of which permanent members of staff	3,192.4	3,310.2	37.4%	30.6%	117.8	3.7%	3,336.0
Professors [2]	**522.6**	**526.9**	**19.7%**	**67.7%**	**4.3**	**0.8%**	**525.7**
Full professors	414.5	415.9	15.9%	64.4%	1.5	0.4%	417.3
Assistant professors	108.1	111.0	34.0%	80.1%	2.9	2.6%	108.4
Scientific staff	**6,402.8**	**6,611.8**	**32.2%**	**73.4%**	**209.0**	**3.3%**	**6,864.3**
Permanent scientific staff	271.7	280.5	14.4%	48.9%	8.8	3.2%	283.2
Temporary scientific staff	5,692.0	5,860.1	32.6%	77.5%	168,2	3.0%	6,017.2
Senior assistants, scientific staff (temporary)	731.4	713.8	26.9%	77.7%	–17.6	–2.4%	719.3
Postdoctoral researchers, scientific assistants II	1,195.5	1,305.2	31.2%	90.6%	109.7	9.2%	1,363.3
Scientific assistants I	3,765.0	3,841.1	34.2%	73.0%	76.1	2.0%	3,934.6
Teaching/research assistants	439.2	471.2	37.2%	36.9%	32.0	7.3%	563.8
Technical and administrative staff	**3,003.1**	**3,106.1**	**43.7%**	**26.6%**	**103.0**	**3.4%**	**3,146.6**
of which permanent members of staff	2,507.4	2,615.4	43.2%	23.3%	107.9	4.3%	2,637.0
Technical and IT staff	1,615.9	1,656.3	20.2%	32.7%	40.4	2.5%	1,671.3
Administrative staff	1,387.1	1,449.8	70.5%	19.6%	62.6	4.5%	1,475.3
Apprentices	**169.7**	**172.8**	**28.9%**	**6.8%**	**3.2**	**1.9%**	**170.0**

1 Including 94.3 FTEs at ETH Singapore SEC Ltd. on average in 2021, 93.7 FTEs on the reporting date; all scientific staff 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 2021: 568 (incl. professors with appointments at other institutions).

► Staff statistics:

STAFF BY AREA

Total staff

Full-time equivalents (FTEs) at the end of 2021 (reporting date) or annual average [1]	FTEs annual average						FTEs on reporting date at y/e
					Increase		
	2020 Total	2021 Total	Women	International	Absolute	in %	2021 Total
ETH Zurich (consolidated)	**10,098.1**	**10,417.6**	**34.9%**	**58.0%**	**319.5**	**3.2%**	**10,706.5**
Academic departments total	**8,067.8**	**8,342.6**	**33.9%**	**65.0%**	**274.9**	**3.4%**	**8,605.3**
Architecture and Civil Engineering	1,027.3	1,061.4	35.9%	60.1%	34.1	3.3%	1,089.6
Architecture	424.3	442.0	42.9%	59.0%	17.7	4.2%	463.2
Civil, Environmental and Geomatic Engineering	603.0	619.4	31.0%	61.0%	16.3	2.7%	626.4
Engineering Sciences	2,469.3	2,605.1	24.2%	71.0%	135.8	5.5%	2,731.0
Mechanical and Process Engineering	745.7	802.4	22.3%	66.6%	56.7	7.6%	839.8
Information Technology and Electrical Engineering	646.2	681.2	20.4%	71.0%	35.1	5.4%	708.9
Computer Science	524.9	576.6	21.5%	72.2%	51.7	9.8%	619.3
Materials	237.4	224.2	31.5%	65.8%	–13.2	–5.6%	230.4
Biosystems Science and Engineering	315.1	320.7	36.5%	83.5%	5.6	1.8%	332.6
Natural Sciences and Mathematics	2,349.5	2,391.1	32.7%	63.5%	41.6	1.8%	2,448.4
Mathematics	299.9	314.9	27.2%	62.3%	15.0	5.0%	320.7
Physics	665.8	694.4	19.8%	59.4%	28.6	4.3%	715.3
Chemistry and Applied Biosciences	791.5	789.8	33.1%	64.1%	–1.7	–0.2%	814.8
Biology	592.2	591.9	50.4%	68.0%	–0.3	–0.1%	597.5
System-oriented Natural Sciences	1,570.7	1,630.8	47.0%	62.3%	60.1	3.8%	1,683.8
Earth Sciences	338.0	342.5	33.9%	67.2%	4.5	1.3%	355.7
Environmental Systems Science	669.0	701.8	48.2%	60.9%	32.8	4.9%	718.7
Health Sciences and Technology	563.7	586.5	53.2%	61.0%	22.8	4.0%	609.4
Management and Social Sciences	651.0	654.3	41.4%	61.0%	3.3	0.5%	652.5
Management, Technology and Economics	343.8	341.8	40.9%	63.0%	–2.1	–0.6%	331.1
Humanities, Social and Political Sciences	307.2	312.5	42.0%	58.7%	5.4	1.8%	321.5
Teaching and research facilities outside the academic departments, others [2]	**587.7**	**564.2**	**35.9%**	**60.4%**	**–23.4**	**–4.0%**	**569.8**
Executive Board, staff units and administrative departments	**1,442.7**	**1,510.8**	**40.0%**	**18.9%**	**68.1**	**4.7%**	**1,531.4**
Executive Board and staff units	168.3	187.3	63.3%	29.7%	18.9	11.2%	193.3
Administrative departments	1,274.4	1,323.6	36.7%	17.3%	49.1	3.9%	1,338.1
Corporate Communications	29.6	30.9	57.2%	24.5%	1.3	4.2%	33.0
Academic Services	66.3	68.1	65.6%	15.8%	1.8	2.7%	71.0
Educational Development and Technology	37.4	40.8	42.9%	29.6%	3.4	9.2%	43.6
Student Services	17.0	17.6	76.3%	4.0%	0.6	3.6%	17.9
Controlling	24.2	24.2	48.0%	12.4%	0.0	0.1%	22.9
Financial Services	18.4	17.9	33.8%	10.7%	–0.6	–3.1%	18.5
Accounting	43.5	41.3	44.0%	18.8%	–2.2	–5.1%	40.2
Facility Management	193.0	198.3	17.5%	15.8%	5.3	2.8%	200.1
ETH Library	218.0	210.5	59.8%	17.9%	–7.5	–3.5%	207.3
Real Estate Management	80.6	82.4	35.8%	14.2%	1.8	2.3%	84.8
IT Services	311.1	335.7	10.8%	22.2%	24.6	7.9%	341.4
Human Resources	74.0	76.7	71.7%	11.9%	2.7	3.6%	77.8
Services	115.1	133.7	45.2%	11.1%	18.6	16.2%	135.1
Safety, Security, Health and Environment	43.2	45.2	31.7%	13.9%	1.9	4.5%	43.8

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 2021. Since 2017, both the headcount and the calculation have been 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, Institute for Theoretical Studies (ITS), Good Manufacturing Practice Facility (GMP Facility), Functional Genomics Center Zurich (FGCZ), NEXUS Personalized Health Technologies, FIRST-Lab, B&R Nanotechnology Center, ScopeM, ETH Phenomics Center, Swiss Seismological Service (SED), Swiss National Supercomputing Centre (CSCS), AgroVet-Strickhof, Swiss Data Science Center (SDSC), Wyss Translational Center Zurich (WTZ), Digital Trial Intervention Platform (dTIP), Center for Climate Systems Modeling (C2SM) and other central projects. The headcount of the fully consolidated unit ETH Singapore SEC Ltd. is also included (93.7 FTEs as at 31 December 2021 and 94.3 FTEs on average in 2021).

NEW PROFESSORSHIPS

New appointments in 2021

FULL PROFESSORS

Professor Kathrin Lang,
Chemical Biology, D-CHAB, formerly Associate Professor at the Technical University of Munich, Germany

Professor Carlo Menon,
Biomedical and Mobile Health Technology, D-HEST, formerly Full Professor at Simon Fraser University, Vancouver, Canada

Professor Hua Wang,
Electronics, D-ITET, formerly Tenured Associate Professor at the Georgia Institute of Technology, Atlanta, USA

Professor Annalisa Manera,
Nuclear Safety and Multiphase Flows, D-MAVT, Group Leader at the Paul Scherrer Institute (PSI), Villigen, Switzerland

Professor Eugene Demler,
Theoretical Condensed Matter Physics, D-PHYS, formerly Full Professor at Harvard University, Cambridge, USA

Professor Leonardo Senatore,
Theoretical Physics, D-PHYS, formerly Associate Professor at Stanford University, Palo Alto, USA

Professor Didier Queloz,
Physics, D-PHYS, also Full Professor at the University of Cambridge, United Kingdom

Professor Verena Griess,
Forest Resources Management, D-USYS, formerly Assistant Professor at the University of British Columbia, Canada

Professor Beate Jessel,
Landscape Development, D-USYS, Director of the Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

PROMOTIONS TO FULL PROFESSOR

Professor Arno Brandlhuber,
Architecture and Design, D-ARCH, formerly Associate Professor at ETH Zurich, Switzerland

Professor Momoyo Kaijima,
Architectural Behaviorology, D-ARCH, formerly Associate Professor at ETH Zurich, Switzerland

Professor Jan De Vylder,
Architecture and Design, D-ARCH, formerly Associate Professor at ETH Zurich, Switzerland

Professor An Fonteyne,
Affective Architectures, D-ARCH, formerly Associate Professor at ETH Zurich, Switzerland

Professor Elli Mosayebi,
Architecture and Design, D-ARCH, formerly Associate Professor at ETH Zurich, Switzerland

Professor Alexandre Theriot,
Architecture and Design, D-ARCH, formerly Associate Professor at ETH Zurich, Switzerland

Professor Thomas Willwacher,
Mathematics, D-MATH, formerly Associate Professor at ETH Zurich, Switzerland

Professor Tanja Stadler,
Computational Evolution, D-BSSE, formerly Associate Professor at ETH Zurich, Switzerland

Professor Dominik Hangartner,
Public Policy, D-GESS, formerly Associate Professor at ETH Zurich, Switzerland

ASSOCIATE PROFESSORS

Professor Benjamin Dillenburger,
Digital Building Technologies, D-ARCH, formerly Assistant Professor at ETH Zurich, Switzerland

Professor Volodymyr M. Korkhov,
Structural Basis of Cellular Signaling, D-BIOL, Group Leader at the Paul Scherrer Institute (PSI), Villigen, Switzerland

Professor Nicola Aceto,
Molecular Oncology, D-BIOL, formerly Assistant Professor at the University of Basel, Switzerland

Professor Peter Hintz,
Mathematics and Physics, D-MATH, formerly Assistant Professor at the Massachusetts Institute of Technology, Cambridge, USA

Professor Vincent Tassion,
Mathematics, D-MATH, formerly Assistant Professor at ETH Zurich, Switzerland

Professor Elizabeth Tilley,
Global Health Engineering, D-MAVT, formerly Senior Lecturer at the University of Malawi, Republic of Malawi

PROMOTIONS TO ASSOCIATE PROFESSOR

Professor Michael Nash,
Engineering of Synthetic Systems, D-BSSE, also Associate Professor at the University of Basel, Switzerland

Professor Randall Platt,
Biological Engineering, D-BSSE, also Associate Professor at the University of Basel, Switzerland

Professor Tobias Schmidt,
Energy and Technology Policy, D-GESS, formerly Tenure Track Assistant Professor at ETH Zurich, Switzerland

Professor Marco Hutter,
Robotic Systems, D-MAVT, formerly Tenure Track Assistant Professor at ETH Zurich, Switzerland

Professor Rachel Grange,
Photonics, D-PHYS, formerly Assistant Professor at ETH Zurich, Switzerland

ASSISTANT PROFESSORS

Professor Manuela Hospenthal,
Molecular and Structural Biology, D-BIOL, formerly group leader at ETH Zurich, Switzerland

Professor Jordon Hemingway,
Surface Earth Evolution, D-ERDW, formerly postdoctoral researcher at Harvard University, Cambridge, USA

Professor Bjarne Steffen,
Climate Finance and Policy, D-GESS, formerly senior researcher at ETH Zurich, Switzerland

Professor Joaquim Serra,
Mathematics, D-MATH, formerly SNSF Ambizione Fellow at ETH Zurich, Switzerland

Professor Judit Szulágyi,
Computational Astrophysics, D-PHYS, formerly senior researcher at the University of Zurich, Switzerland

Professor Núria Casacuberta Arola,
Physical Oceanography, D-USYS, formerly senior researcher at ETH Zurich, Switzerland

Professor Johanna Jacobi,
Agroecological Transitions, D-USYS, formerly associate senior research scientist at the University of Bern, Switzerland

Professor Catherine De Wolf,
Circular Engineering for Architecture, D-BAUG, formerly Assistant Professor at Delft University of Technology, Netherlands

Professor Máté Bezdek,
Functional Coordination Chemistry, D-CHAB, formerly postdoctoral researcher at Massachusetts Institute of Technology, Cambridge, USA

Professor Patrick Steinegger,
Radiochemistry, D-CHAB, Group Leader at the Paul Scherrer Institute (PSI), Villigen, Switzerland

Professor Sarah Hofer,
Learning and Technology, D-GESS, formerly senior researcher at the Universität der Bundeswehr München, Munich, Germany

Professor Marina Krstic Marinkovic,
Computational Physics, D-PHYS, formerly Assistant Professor at Ludwig-Maximilians-Universität, Munich, Germany

Professor Anna Sótér,
Low Energy Particle Physics, D-PHYS, formerly lecturer and SNSF Ambizione Fellow at ETH Zurich, Switzerland

Professor Mutian Niu,
Animal Nutrition, D-USYS, formerly Assistant Professor at the University of Pennsylvania, Philadelphia, USA

ADJUNCT PROFESSORS

Professor Fernando Perez Cruz,
D-INFK, Chief Data Scientist at the Swiss Data Science Center (SDSC) and lecturer in the Department of Computer Science at ETH Zurich, Switzerland

Professor Sebastian Huber,
D-PHYS, senior scientist in the Department of Physics at ETH Zurich, Switzerland

Professor Michael Sander,
D-USYS, senior scientist in the Department of Environmental Systems Science at ETH Zurich, Switzerland

Professor Kristin Schirmer,
D-USYS, lecturer in the Department of Environmental Systems Science at ETH Zurich, Head of Department at Eawag, Dübendorf, and Adjunct Professor at EPFL, Lausanne, Switzerland

OVERVIEW OF HUMAN RESOURCES AND INFRASTRUCTURE

SERVING THE UNIVERSITY

Personnel Development and Leadership and Infrastructure are areas that provide integral, state-of-the-art facilities and services for teaching, research, knowledge transfer and dialogue with the public.

In 2021 the **Office of Vice President for Personnel Development and Leadership (VPPL)** comprised, first and foremost, the **Human Resources** department, which provides advice and support for ETH employees and plays an active role in their personal and professional development. The HR department also manages – and is actively involved in – ETH-wide projects, such as the new Respect campaign and the employee survey. As well as HR, a number of new units have joined VPPL: **Faculty Services**, **Equal!** and the **Reporting Office Conflict Management** (see page 47). Synergies have made it possible to address various focus areas highlighted in ETH Zurich's strategy.

"Lifelong learning" for ETH employees: Leadership skills have been drawn up as a basis for the personal development of employees and for use in HR processes. At the start of February, Personnel and Organisational Development, the Career Center, the Office of Research and AVETH held a career week for postdoctoral researchers with numerous talks and workshops. VPPL launched a project aimed at creating a system based on lifecycle and skills for lifelong learning, with suitable offerings.

Promoting equal opportunities, inclusion and diversity: The team from the Equal! office, now known as ETH Diversity, drew up a plan to formulate a diversity strategy for ETH and supported both the ALEA Award and the new AVETH Diversity Award.

Inappropriate behaviour and conflicts: The VPPL gathered information about the improvements needed to the complaints and counselling processes.

At the end of 2021 VPPL finalised its restructuring, effective as of 1 January 2022, in order to meet new challenges more effectively.

The Office of Vice President for Infrastructure (VPIN) not only had to deal with the impacts of the pandemic – which continued to create a lot of work on top of the usual workload – but also numerous ongoing projects.

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 of the required facilities and building infrastructure in a timely and cost-effective manner. Several VPIN and VPPL departments moved into the new OCTAVO building in Oerlikon, which has been totally revamped to meet modern requirements and provides multispace and shared desk options. Approval of the legal planning framework for the further development of the Hönggerberg campus has now cleared the way for this project to go ahead. Major construction projects (ML Halle, BSS, GLC, HIF) continued in 2021; renovations started on the Main Building (forecourt/garage) in summer 2021; the Student Project House opened and the laboratory wing extension to the HIF building was ready to move into.

The **Facility Management** department, which has overall responsibility for utilities and technical and infrastructure management for all ETH buildings and facilities, began to implement its strategy. This strategy forms part of the action plan and is reflected in follow-up documents, such as ETH's building management policy.

The **Safety, Security, Health and Environment (SSHE)** department develops overarching guidelines, raises awareness, provides advice on dealing with hazards to protect people, the environment and infrastructure, and participates in the implementation of measures. The functional strategy of the department, as well as its training concept, will provide a solid base for operational aspects.

IT Services provides services relating to information and communication technology and also runs the extensive infrastructure, IT systems and applications required for this. The successful completion of projects for the total revamping of the campus-wide WLAN (Alarmnet), e-mail certificates for all employees, and collaboration tools (such as M365/Teams, Zoom) were the first measures to be introduced under the strategy. IT security measures were significantly tightened.

The **ETH Library** promotes knowledge and supports teaching and research. The swisscovery facility (Swiss Library Service Platform AG) administers and provides access to books, journals and other media held at over 470 libraries across Switzerland. The ETH Library benefits from synergy effects in the management of online resources and cataloguing. It continues to push ahead with the implementation of its strategy while focusing on the action area of customer-focused services.

The **Services** department makes life at ETH – both in terms of work and leisure – much easier. The strategy resulted in various measures, including the functional substrategy for workshops at ETH Zurich as well as Servix, a tool for integrated event management.

GOVERNANCE AND SUSTAINABILITY

A distinctly presidential system combined with a well-established system of participation by the Executive Board, departments and University Assembly enables viable solutions for the successful further development of 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 risk awareness among ETH staff. ETH Zurich is not only one of the world's top-ranking universities in energy, environmental and sustainability research, but also integrates sustainability principles in all areas of campus development.

ETH Zurich/Alessandro Della Bella

RETHINK PROJECT MOVING ALONG

As part of the "rETHink" project, ETH members gave serious thought to the way the university is organised and how people work together. The analysis phase has been completed and action areas have been defined. Now the task is to come up with solutions. The aim of rETHink is to adapt processes and responsibilities within ETH to the new challenges so as to create long-term space for the university's core tasks, namely, research, teaching, knowledge transfer and outreach.

► rETHink:

ETH Zurich / Markus Bertschi

PRACTISING PARTICIPATION AND A CULTURE OF QUALITY – REALISING GOALS

ETH Zurich has begun to realise the goals set out in the Strategy and Development Plan 2021–2024 and to review and adapt its strategy development processes. It has also defined quality assurance more clearly. This is entirely in keeping with the distinctive culture of quality attributed to ETH by a group of experts on the occasion of its institutional accreditation.

By Martina Märki

In its Strategy and Development Plan 2021–2024, ETH Zurich has defined several strategic action areas that create room for open-ended basic research, application-oriented research and new training programmes. Interdisciplinary cooperation and knowledge and technology transfer are being strengthened. ETH has prepared the way in important strategic action areas by establishing new centres.

ETH AI Center successfully launched

The ETH AI Center, founded in 2020, can look back on a very successful first year. Launched with 29 participating professorships, the Competence Centre now has over 100 professors. Artificial intelligence (AI) will change the way humans and machines interact. This change opens up huge potential for research, development and start-ups. AI methods are now used in all research disciplines and sectors. Collaboration between talented members of multidisciplinary teams provides the best foundation for innovative, useful and trustworthy applications of artificial intelligence. The ETH AI Center promotes interdisciplinary collaboration in research and supports talent through fellowship programmes. It also makes targeted efforts to strengthen AI start-ups and entrepreneurship. Through research and training, it plays a major role generally in making Zurich and Switzerland increasingly attractive for the AI sector and for large and small companies.

The foundation stone of another forward-looking Competence Centre was laid in 2021: the renowned planetary scientist and Nobel Prize winner Didier Queloz took up his position as Professor of Physics at ETH, where he will become the first Director of the new "ETH Center for the Origin and Prevalence of Life". In this new centre, professors from five departments will jointly study the origin of life. The centre will be established in mid-2022 and will bring researchers from fields such as astrophysics, biochemistry and molecular chemistry as well as earth sciences even closer together. ETH Zurich plans to use the centre to position itself as a leading institution among those seeking to answer questions about the origin of life – and thus directly strengthen Switzerland as a centre of research.

◄ The ETH Executive Board, from left to right: Detlef Günther, Vanessa Wood, Ulrich Weidmann, Joël Mesot, Katharina Poiger Ruloff (Secretary General), Günther Dissertori (Rector since February 2022), Julia Dannath and Robert Perich.

Rethinking and adapting strategy processes

In parallel with the implementation phase of the current Strategy and Development Plan 2021–2024, ETH Zurich has already begun preparations for the period from 2025 onwards. As part of a review of the current situation, an evaluation of the strategy development processes was carried out with the aim of adapting them to the increasingly complex structures of a rapidly growing ETH.

This is entirely in keeping with a broadly internalised culture of quality based on participation, trust and the ETH spirit. These are the very values attributed to ETH by a group of experts in 2021 in the context of the accreditation process.

ETH Zurich receives official accreditation

Since the Swiss Higher Education Act entered into force in 2015, all public and private institutions of higher education that wish to use the designation of "university", "university of applied sciences" or "teacher training college" have had to be accredited every seven years. In October 2021, ETH Zurich was one of the first universities to receive this accreditation. It is awarded by the Swiss Accreditation Council, which is made up of twenty independent members, including representatives from the world of employment, various higher education institutions, students, scientific staff and academic staff. The accreditation certifies that ETH meets the specified standards with regard to quality strategy, governance, teaching, research, services, resources, and internal and external communication.

ETH Zurich chose the Swiss Agency of Accreditation and Quality Assurance (AAQ) to carry out the audit. The basis of the procedure is a self-assessment report. All university groups, departments and Executive Board staff units were involved. Workshops were held in which the participants contributed their assessment of the total of 18 quality standards specified in the accreditation process.

Internal quality assurance

In parallel with these activities, the university developed and published "Guidelines on the internal quality assurance system" in 2020. They describe the QA system in place at ETH Zurich and outline the qualitative goals of the university's Strategy and Development Plan for teaching, research, knowledge and technology transfer, and also resources. The guidelines also identify the key processes and organisational structures that will ensure these goals are achieved.

This enabled ETH to demonstrate that quality assurance is broadly supported in its culture and organisation. This includes the Executive Board strategy process, the appointment procedure for professors, evaluations of departments and study programmes, teaching evaluations, and the firmly embedded culture of participation through the university groups. Many processes follow the principle of subsidiarity and are organised in a decentralised way.

The report still sees potential for improvement in some areas and contains recommendations for ETH. For example, the quality assurance strategy should explicitly name the functions and bodies responsible for the different processes. The quality assurance strategy should also be more firmly embedded in the Strategy and Development Plan. Furthermore, processes should be better communicated both internally and externally, and participation by students and scientific staff should be guaranteed for the long term. As explained above, relevant adjustments are already under way.

Other recommendations for the university, such as measures to improve support for doctoral students, found willing listeners at ETH: "In connection with the organisational development project rETHink, we have subjected our processes to a fundamental analysis, and ETH members from all areas are currently working on proposed solutions aimed precisely in this direction," says ETH President Joël Mesot.

► Strategy:

ETH ZURICH EXECUTIVE BOARD 2021/22

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)
was Full Professor of Geotechnical Engineering at ETH Zurich from 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. From January 2015 she was Rector of ETH and deputy to the President. She stood down as Professor and Rector on 31 January 2022.

Detlef Günther (1963)
was Assistant Professor from 1998 to 2003, Associate Professor from 2003 to 2008, and Full Professor of Trace Element and Microanalysis at the Laboratory of Inorganic Chemistry at ETH Zurich from February 2008. From 2015 to 2019 he was Vice President for Research and Corporate Relations. He served as interim Vice President for Knowledge Transfer and Corporate Relations in 2020 and has been Vice President for Research since 2020.

Secondary employment
(as of 31 December 2021)

Member of the Foundation Board and Second Vice Chair of the Marcel Benoist Foundation; Member of the Global Network Advisory Board WEF Centre for the Fourth Industrial Revolution; Member of Governing Board, Geneva Science-Policy Interface; Co-Chair of the Academic Forum Geneva Science and Diplomacy Anticipator

Member of the Swiss Accreditation Council

Member of the Board of Directors of GRS Gemresearch Swisslab AG, Member of the University Council of the Technical University of Darmstadt

Remuneration

In 2021, the salaries of the seven members of the Executive Board, including the employer's social security contributions, came to 2.94 million Swiss francs (last year: 2.25 million Swiss francs*).

The total sum includes 0.48 million Swiss francs (last year: 0.41 million Swiss francs) for pension benefits and 0.17 million Swiss francs (last year 0.13 million Swiss francs) for other social security contributions.

* The Executive Board had five members up to the end of October 2020. Julia Dannath assumed office in November 2020 and Vanessa Wood in January 2021.

ETH Zurich / Markus Bertschi

Vanessa Wood (1983)
was Assistant Professor from 2011 to 2015 and Associate Professor from 2015 to 2019. She has been Full Professor of Materials and Device Engineering at ETH Zurich since 2019. She was Head of the Department of Information Technology and Electrical Engineering from 2018 to 2020. As of 2021, in addition to her full professorship, she is also Vice President for Knowledge Transfer and Corporate Relations.

Scientific Advisor Battrion AG

Robert Perich (1961)
has a doctorate in business administration and has been Head of ETH's Finance and Controlling 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.

Member of the University Council of the University of Cologne; Guest Lecturer for the CAS University Leadership and Governance programme at the University of Zurich

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 was Vice President for Human Resources and Corporate Relations from 2016 to 2019. He has been Vice President for Infrastructure since 2020 and was also interim Vice President for Personnel Development and Leadership from January to November 2020.

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); Langfristplanung Personenverkehrsangebot (long-term planning of passenger transport services); Member Sounding Board Rail 2050, Federal Office of Transport

Julia Dannath (1977)
holds a doctorate in psychology and has been Vice President for Personnel Development and Leadership since November 2020. Previously she worked for 12 years as a psychologist and most recently as the CEO of a consulting company supporting international organisations in developing their leadership and corporate culture.

Member of the Supervisory Board: Asklepios Kliniken GmbH & Co. KGaA, Mediclin AG, Rhön Klinikum AG. Founding Partner and Member of the Board of Directors of Alsia & Partners AG; Board Member: Executive MBA Community, University of St. Gallen

New Rector since February 2022:

Günther Dissertori
In May 2021, the ETH Board elected Günther Dissertori as the new Rector of ETH Zurich, and he has been in office since February 2022. Born in South Tyrol (Italy), he studied physics at the University of Innsbruck and carried out doctoral research at CERN in Geneva. He came to ETH as an assistant professor in 2001 and was appointed Full Professor of Particle Physics in 2007. Dissertori made a name for himself as a researcher in connection with the CMS experiment at CERN. He has received several awards for his teaching.

ORGANISATION CHART

As of 31 December 2021

◀ **Ombudspersons**

MANAGEMENT AND CENTRAL ADMINISTRATION

Executive Board and General Secretariat

President
Professor Joël Mesot

Rector
Professor Sarah Springman

Vice President for Research
Professor Detlef Günther

Vice President for Knowledge Transfer and Corporate Relations
Professor Vanessa Wood

Vice Rectors (VRs) and Associate Vice Presidents (AVPs)

AVPs for:
– Sustainability
– Digital Transformation

VRs for:
– Study Programmes
– Curriculum Development
– Doctoral Studies
– Continuing Education

– AVP for Medicine

Staff units

– Office of the President
– Office for Faculty Affairs

– Rector's Staff

– Office of Research

– Office of Knowledge Transfer and Corporate Relations

Administrative departments

– Corporate Communications

– Academic Services
– Student Services
– Educational Development and Technology

ACADEMIC DEPARTMENTS

Architecture and Civil Engineering

Architecture

Civil, Environmental and Geomatic Engineering

Engineering Sciences

Mechanical and Process Engineering

Information Technology and Electrical Engineering

Computer Science

Materials

Biosystems Science and Engineering

Natural Sciences and Mathematics

Mathematics

Physics

Chemistry and Applied Biosciences

Biology

University Assembly ▶

Vice President for Finance and Controlling **Dr Robert Perich**	Vice President for Infrastructure **Professor Ulrich Weidmann**	Vice President for Personnel Development and Leadership **Dr Julia Dannath-Schuh**	Secretary General **Katharina Poiger Ruloff**
– Office of Finance and Controlling	– Office of Infrastructure	– Office of Personnel Development and Leadership	– Legal Office
– Controlling – Accounting – Financial Services	– Real Estate Management – Facility Management – IT Services – ETH Library – Services – Safety, Security, Health and Environment	– Human Resources	

System-oriented Natural Sciences	**Management and Social Sciences**
Earth Sciences	Management, Technology, and Economics
Environmental Systems Science	Humanities, Social and Political Sciences
Health Sciences and Technology	

► Competence centres and teaching and research facilities outside the academic departments:

RISK MANAGEMENT

A SYSTEMATIC PROCESS

ETH Zurich's university-wide risk management system takes a holistic approach that considers both potential internal and also external risks. The systematic process is based on the internationally established risk management standard ISO 31000. The purpose of risk management is to protect the tangible and intangible assets on which the success of ETH Zurich depends, in particular human capital, infrastructure and reputation.

Legal basis 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.

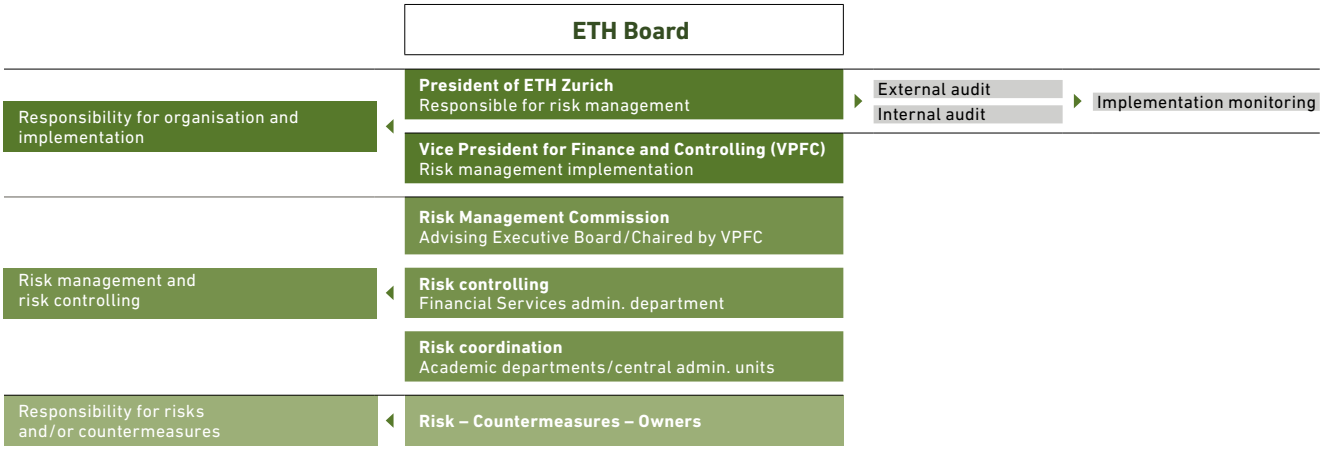
The essential parameters of risk management and risk financing are laid down in the ETH Board's directive on risk management at ETH and the research institutions. As the officeholder with overall responsibility for risk management at ETH Zurich, the ETH President informs the ETH Board on an annual basis about the core risks. 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 reporting, assessing, minimising and controlling risk, while overseeing the process as a whole. The Executive Board is informed regularly about any substantive risks. ETH Zurich has nominated one or more officers responsible for each core risk and relevant control measures.

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 innovative, research-based and skills-oriented education, training and development 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. The broad embedding of integrity in teaching, support from confidants, a rigorous approach to academic misconduct, and the work of ETH's delegates 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, cyber attacks or unauthorised data access** present considerable risks to ETH's business processes. Specialist teams and the Chief Information Security Officer continuously review the measures implemented to achieve the protection targets defined as part of IT security, and adapt them to the ever more challenging threat situation.

- **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 acceptance and enhances the reputation of ETH Zurich. Failures of communication can erode credibility and trust among key stakeholders in politics and society.

- **Violence or threats against the person** are not limited to actual physical aggression, but are also manifested in threats of violence, abuse of power and any forms of sexual harassment. Through preventive measures and constant reassessment of the current level of threat based on standardised instruments, the ETH Threat Management Team defuses problems and conflicts at an early stage before they escalate into violence. Also, the Respect advice and conciliation service is on hand to address tensions and situations involving sexual harassment.

- **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, transfer and the management of the university may be unavailable for an extended period or that important research and teaching activities are wholly or partially cancelled. 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.

- **Significant impairments of ETH operations due to a major event** (e.g. pandemic) entail the risk that the core business of ETH is completely or partially impaired (e.g. general obligation to work from home; teaching, research, knowledge transfer and/or management moved online or suspended).

- **Adequate premises, in terms of both quantity and quality,** are crucial for teaching, research and transfer and allow growth targets to be implemented. Partial or total loss of infrastructure within a room or an entire building can impair ETH Zurich's teaching and research activities or render them impossible. Lack of space, viable building plots and financial and human resources jeopardises change, the achievement of growth targets and the recruitment of highly qualified staff.

- A new system to survey the views of scientific staff is among the new measures to ensure the **early detection of conflicts** arising from incorrect management and supervisory behaviour. This allows continuous monitoring of the satisfaction, supervision and development of doctoral students, postdoctoral researchers and senior assistants. In the area of prevention, the main focus is on the training and support of staff in management functions, as well as on the structured onboarding and supervision of doctoral students, postdoctoral researchers and other staff.

- **Non-association with European research framework programmes** has far-reaching implications for ETH Zurich, such as greater difficulty recruiting high-calibre scientists in the future, the risk of losing current talent and – given the lack of access to internationally important strategic research areas – potentially more difficult cooperation with European companies.

NON-ASSOCIATION OF SWITZERLAND WITH EUROPEAN RESEARCH FRAMEWORK PROGRAMMES

From 2021, Switzerland will be treated as a non-associated third country for Horizon Europe research project submissions and related programmes and initiatives. As participants from a non-associated third country, neither researchers nor innovators in Switzerland can take on coordination tasks in collaborative projects. Nor, in principle, can they participate in individual projects such as those funded by grants from the European Research Council (ERC), the European Innovation Council (EIC) and the European Marie Skłodowska-Curie Fellowships (MSCA).

Switzerland's fully associated participation in the world's largest research funding programme is vitally important both for ETH Zurich and for Switzerland generally as a centre of research. Around half of all international collaborations at ETH Zurich are currently with EU countries. Europe is also the most important international partner for other Swiss universities. Since 2007, ETH researchers have received in excess of 500 million Swiss francs from the European Research Council (ERC) to advance their projects. Yet finances are only one aspect. Far more important for Horizon Europe is international cooperation and competition among Europe's best universities. Swiss researchers will now only be able to compete to a limited extent. This will make Switzerland a less attractive place to work for top researchers.

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. In 2021, WWF Switzerland named it Switzerland's most sustainable university.

Sustainability is one of ETH Zurich's strategic action areas. Through research, teaching and innovation, it promotes the sustainable use of resources. It is aiming for net zero greenhouse gas emissions by 2030 and supporting this transformation process with research and teaching projects. In dialogue with society, the university builds strategic partnerships and fulfils its role as a knowledge source for evidence-based policy.

1. Research
Through its research activities, ETH Zurich furnishes the scientific and technical knowledge required for a sustainable society. In addition to the broad spectrum of cutting-edge research in the academic departments, ETH Zurich can draw on the interdisciplinary and transdisciplinary expertise of its various competence centres in order to address major societal challenges such as energy supply, the sustainable design of living spaces, food security and climate change.

2. Teaching
ETH Zurich trains the next generation of specialists and experts to ensure they actively integrate sustainability aspects into their professional lives. Over the 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 diverse, participatory and respectful environment. The university endeavours to serve as a "living lab" which develops, implements and tests pioneering solutions that conserve natural resources and reduce environmental impacts. As a publicly funded university, sustainability is also among the core principles of ETH Zurich in terms of financial planning and investment strategy.

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.

▼ The 2019/20 report documents ETH's commitment to sustainability, including around 50 sustainability goals.

TRANSPARENCY AND CREDIBILITY

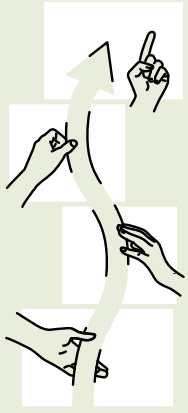
ETH has been documenting its sustainability performance for the last twenty years. Its energy report, first published in 2002, was developed into a broader environmental report in 2005. Since 2009/2010, the report has included ecological, economic and social aspects. The Sustainability Report (latest edition: 2019/2020) 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.

► Sustainability report:

GOVERNANCE AND SUSTAINABILITY OVERVIEW

FREEDOM TO SUCCEED

The management structure of ETH Zurich combines a presidential system with a well-established system of participation and freedom of action at departmental level.



Freedom and individual responsibility, open-mindedness and entrepreneurial spirit: 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. Furthermore, ETH Zurich lives and promotes the principles of sustainable development in research and teaching, on campus and in dialogue with society (see page 64). Connected with Europe and the world, ETH develops solutions for the global challenges of today and tomorrow.

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

Within ETH Zurich, the **President** bears overall responsibility, specifically in the areas of strategy, appointments and finance. The President nominates 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 the robustness and acceptance of the decisions taken as a form of quality assurance across the whole institution. The Executive Board, the academic departments and the University Assembly (a university-wide body in which the teaching staff, scientific staff, students and administrative and technical staff are equally represented) are involved in this broad-based decision-making process.

The **Executive Board** acts with the aim of ensuring that the university fulfils its social and economic responsibilities. It is composed of seven members: the President, the Rector (Vice President for Education, nominated by the professors), and Vice Presidents for Research; Finance and Controlling; Infrastructure; Knowledge Transfer and Corporate Relations; and Personnel Development and Leadership.

The Executive Board issues study directives and regulates the organisation of the university. It decides on the establishment, merger and closure of departments and other units. 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.

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 Zurich 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.

Maintaining strategic and financial freedom of action as well as independence in teaching and research is vital for ETH Zurich. Only in this way can the university strengthen its position as a national 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 and responsible funding management allow more reliable planning and help ensure sustainable development. This allows ETH Zurich to respond quickly to issues impacting society today and tomorrow.

FINANCE

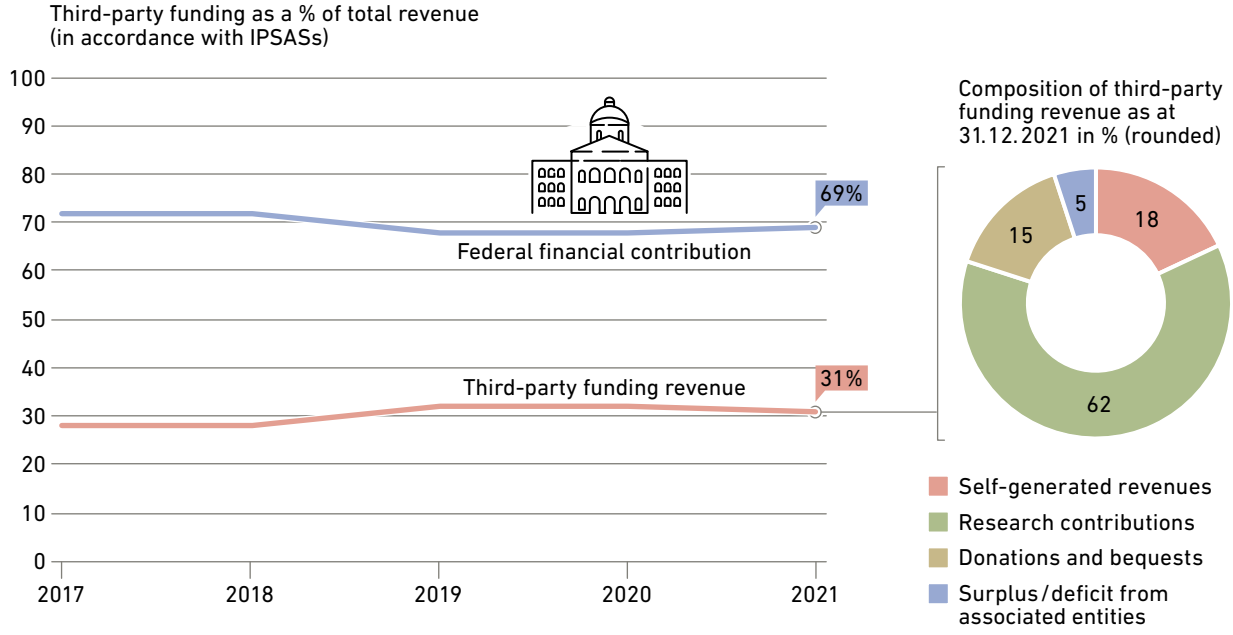
INNOVATIONS FOR THE GLOBAL POPULATION

The Open ETH project promotes new subject areas of strategic relevance. One of the initiatives it supports is ETH for Development (ETH4D): this aims to develop innovations for the global population and educate decision-makers to deliver development that is equitable worldwide. To that end, ETH4D connects researchers in engineering, natural sciences and social sciences with society, governments and industry. One example is the joint Master's degree with Ashesi University in Ghana. ETH4D is funded from the ETH global budget and third-party funds.

► Open ETH:

Ashesi University

Over the years, third-party funding revenue has grown as a percentage of total revenue. Research contributions make up the largest share of third-party funding.



A SUSTAINABLE FUNDING SYSTEM ALLOWS FOR RELIABLE PLANNING

Reliable financial planning is key to ETH Zurich's ability to successfully fulfil its diverse role as a national university competing on the international stage. In this context, the time-tested global budget provided by the federal government is an essential, stable foundation for sustainable development. But it is also flexible enough to be able to respond to the unexpected.

By Corinne Johannssen

Strategic and financial freedom are essential if ETH Zurich is to compete successfully in the education, research and innovation arenas at international level. This freedom is underpinned to a large extent by a long-term, sustainable funding policy, based on a financial plan covering a period of several years, long-term balance sheet management and a modern approach to financial governance. A solid total federal contribution provides an essential basis for this. Selective diversification of funding sources, together with the reserves actively managed through responsible, cost-effective funding management, also allow for more reliable planning. 2021 once again highlighted the importance of this dual foundation. Generally, the financial outlook remains strained due to the

ETH Zurich/Markus Bertschi; Infographics: 1kilo

ongoing coronavirus pandemic. On the third-party funding side, substantial amounts of EU research funding are at risk of being lost due to the failure to establish a framework agreement. It is only thanks to ETH's long-standing efforts to diversify its funding sources that it has sufficient scope to cushion the impact of such changes.

The total federal contribution takes the form of a global budget in line with the Federal Council Dispatch on the Promotion of Education, Research and Innovation (ERI Dispatch). A global budget helps ETH as an autonomous university to set and plan its priorities freely. Robert Perich, Vice President for ETH Finance and Controlling at ETH Zurich, stresses the flexibility: "We are able to set priorities ourselves and thus use funds cost-effectively and to suit our needs."

Third-party funding mostly has a specified purpose

Unlike the total federal contribution, project-oriented third-party funding mostly has a purpose specified by the donors – that is, by research funding agencies, industry partners, foundations or private individuals.

Currently, third-party funding revenue comes mostly 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, ERC grants) is of major relevance, as are collaborations with industry. "We are very successful in raising competitive third-party funding. It is all the more painful for us when a pillar such as direct participation in EU Framework Programmes for Research and Innovation is lost," says Perich.

Also important is funding for research relating to projects in collaboration with the federal government (Ressortforschung), cantons, local authorities and various international organisations.

Third-party funding revenue also includes grants (donations, legacies/bequests). By far the largest share of the grants comes through the ETH Zurich Foundation (see page 70). Grants from foundations and private individuals in particular have grown in importance in recent years.

Besides project-oriented third-party funding and grants, the funds generated by ETH Zurich itself are also classed as third-party funding. These include tuition fees, various items of service revenue and net finance income.

Academic freedom is preserved

It is vital for ETH Zurich to manage the third-party funding entrusted to it responsibly, in conformity with its strategy and for the intended purpose. Its top priority here is always to maintain its independence in teaching and research. "Even though these are dedicated funds, donors do not place any constraints on academic freedom. There are clear rules on this," states Perich. These are defined guidelines with clearly communicated principles, such as the ETH Zurich Code of Conduct for Scientific Cooperation, the ETH Zurich Code of Conduct for Dealing with Contributions or the ETH Zurich Foundation Code of Conduct.

The diversification of the funding base is reflected in the steady increase in third-party funding revenue as a percentage of total revenue. This underscores the growing importance of third-party funding revenue for the university. Under the current ERI Dispatch, the ETH Domain is expected to increase third-party funding as a percentage of total financing by the end of 2024 (see page 4). The target of just under a third at the level of the ETH Domain is within reach.

Mastering challenges through diversification

The three sources of funding – the total federal contribution (global budget), project-oriented third-party funding and self-generated revenues – allow ETH to meet the challenges it faces as a result of the need to develop and expand teaching and research capacity, invest in

"A look at ETH's revenue performance in recent years reveals the growing importance of third-party funding, and donations in particular. But the federal contribution, in the form of a global budget growing at a steady rate, remains vital for sustainable funding."

Robert Perich, Vice President for Finance and Controlling

asset maintenance and expand its infrastructure. "We aim to safeguard ETH's long-term capacity for academic development by fully exploiting our funding potential," says Perich in summary.

This diversification enables integrated planning. In research, for example, third-party funding may enable more than basic equipment. Sometimes, third-party funding is simply available faster than funds from the total federal contribution. If, on the other hand, an application for research funding is turned down, a professorship still has an adequate basis on which to plan for the future. "Basic equipment as a share of a professorship at ETH is relatively high and this share can generally be used very flexibly," says Perich, adding: "This enables professorships to adopt a much more entrepreneurial approach."

Above all, ETH as an institution needs a very long-term view in its academic planning. The strategic decision to set up a new full professorship, for example, has long-term financial consequences: the average duration of an active professorship is 23 years. Especially when the focus of a professorship is experimental, this results in total costs over the term in the mid double-digit millions. The high average duration of a professorship also shows how attractive ETH is as an employer. Only a handful of professors leave ETH early.

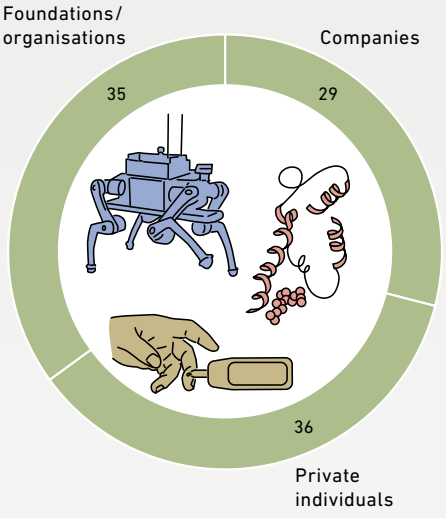
Support from donors

As an institution, ETH Zurich supports selected strategies and a certain level of growth in that it is able to reach donors via the ETH Zurich Foundation. "We have a strategy and actively approach donors with a view to obtaining additional resources," says Perich. However, he also sees a trade-off here: "Donors prefer to invest in people rather than infrastructure." As these investments of third-party funding are not sufficient to cover the full associated costs, the right funding mix is crucial for sustainable planning. It must be possible, for example, to use a larger proportion of the total federal contribution to cover infrastructure costs.

Technology platforms such as the Swiss National Supercomputing Centre (CSCS) in Ticino are one means of achieving cost efficiency. Here, ETH combines highly specialised infrastructure and also makes it available to other science partners under a national mandate. But for scientists to benefit from such platforms, they have to be planned, implemented and operated centrally. Such platforms can be installed and operated within the limits of a global budget. This enables not just one single professorship but ETH as a whole to adopt a more entrepreneurial approach.

The ETH Zurich Foundation's funds come in similar proportions from private individuals, foundations/organisations and businesses.

ETH Zurich Foundation sources of funding 2003–2021 in %



ETH ZURICH FOUNDATION

The support provided by private donors or bequeathers, foundations and businesses via the ETH Zurich Foundation established in 2003 allows strategic projects to be implemented faster – for example, when new professorships receive assistance in the form of up-front financing. This support enables ETH Zurich to inject fresh momentum into the development of teaching and research with the focus on particular subject areas. It also enables additional talent programmes: the Excellence Scholarships, study grants and the Pioneer Fellowship programme for researchers with entrepreneurial ambitions. Clear rules and processes ensure corporate governance and procedures. Recipients of the support are always guaranteed freedom in teaching, research and publication.

► Annual report of the ETH Zurich Foundation:

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 2021, the federal financial contribution granted to ETH Zurich (global budget) amounted to 1,316 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 directly by the federal government as the parent (at the Federal Office for Buildings and Logistics (FOBL)).

Global budget (CHF million)

	2021	2020	Absolute change
Expenditure credit (ETH Zurich financial statements)	1,176	1,151	25
Investment credit (FOBL/Federal Government financial statements)	140	164	–24
Federal financial contribution (global budget))	**1,316**	**1,315**	**1**
Dedicated reserves released (+) / recognised (–) (investment credit, FOBL/ Federal Government financial statements) [1]	–	30	–30
Total (recognised in income)	**1,316**	**1,345**	**–29**

1 For the portion of the investment credit remaining in 2018 (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 2018, these reserves were not recognised in income for ETH Zurich. In 2019 and 2020, the Federal Finance Administration approved the release of 10 million and 30 million Swiss francs of these dedicated reserves, respectively, which were available to ETH Zurich in the previous years as income for a specified purpose.

Consolidated third-party funding income amounted to 558 million Swiss francs and consisted of project-oriented research contributions, grants and self-generated revenues. Together with the global budget of 1,316 million Swiss francs recognised in income, ETH Zurich's total income came to 1,875 million Swiss francs in 2021.

Rounding differences: the totals of the figures given on this page may not correspond precisely to the total amounts shown in the tables or graphics because they are calculated on unrounded amounts.

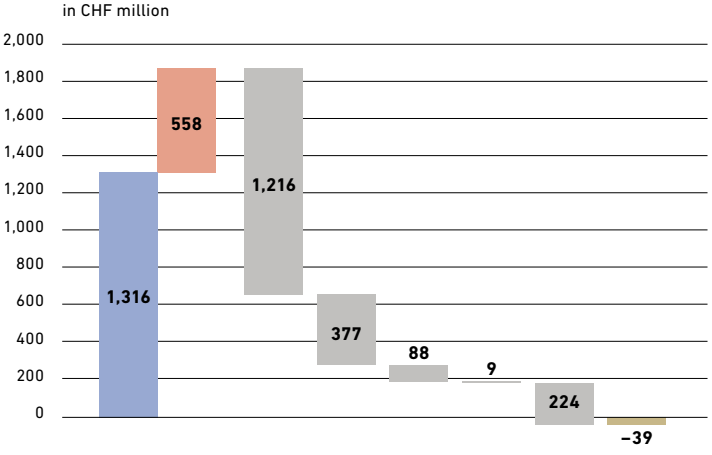
USE OF FUNDS

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 negative consolidated net income of 39 million Swiss francs in 2021 (previous year: –32 million Swiss francs).

Construction spending in connection with the development and management of the property portfolio amounted to a total of 233 million Swiss francs in 2021 and was financed through investment credit (140 million Swiss francs), expenditure credit (91 million Swiss francs) and third-party funding income (1 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 174 buildings and facilities and 66 plots of land. The carrying amount of the plots of land was 693 million Swiss francs at the end of 2021. The buildings were stated in the accounts at a value of 1,234 million Swiss francs at the end of 2021 and their replacement cost (gross cost) was 3,653 million Swiss francs.

Income (1,875 million Swiss francs) and its use



Expenditure credit and investment credit (recognised in income) 1,316
Third-party funding income (consolidated) 558
Use (consolidated)
Personnel expenses 1,216
Other operating expenses excl. construction spending (not capitalised) 377
Other operating expenses excl. construction spending (capitalised) [2] 88
Construction spending (not capitalised) 9
Construction spending (capitalised) [2] 224
Net income (consolidated) [1] –39

1 Consolidated net income (–39 million Swiss francs) was 133 million Swiss francs lower than the consolidated surplus in accordance with IPSASs (94 million Swiss francs) due to specific effects of accounting requirements (mainly revenues on an accrual basis, effects of IPSAS 39 and the share of surplus or deficit of associated entities) and investments, which were well above the depreciation charges recognised in the IPSAS financial statements.
2 Under IPSASs, investment expenditure (313 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.

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 94 million Swiss francs was reported for 2021 (an increase of 43 million Swiss francs or 85 percent compared with the previous year). It comprised the operating surplus of 34 million Swiss francs (an improvement of 36 million Swiss francs), the share of surplus/deficit of associated entities of 27 million Swiss francs (a decrease of 6 million Swiss francs) and net finance income of 32 million Swiss francs (an increase of 12 million Swiss francs).

The operating revenue generated in 2021 amounted to 1,837 million Swiss francs (an increase of 2 million Swiss francs or 0 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, was up slightly to 1,310 million Swiss francs (an increase of 17 million Swiss francs or 1 percent). Revenue from donations and bequests came to 89 million Swiss francs (a decrease of 31 million Swiss francs or 26 percent). Revenue from research contributions rose to 366 million Swiss francs (an increase of 10 million Swiss francs or 3 percent).

Operating expenses declined to 1,803 million Swiss francs (a decrease of 35 million Swiss francs or 2 percent) due to lower personnel expenses (down by 28 million Swiss francs or 2 percent). These fell despite the rise in average full-time equivalents by 320 FTEs to 10,418 FTEs (an increase of 3 percent), which resulted in higher salaries and wages (up by 30 million Swiss francs or 3 percent). The fall was due to the fact that the effects of risk sharing (first-time inclusion of risk sharing in the measurement of net defined benefit liabilities in the previous year) were not reflected in net pension costs until the reporting period. Other operating expenses fell (by 13 million Swiss francs or 3 percent) due in particular to a year-on-year increase in the amount recognised as assets in the course of completing large construction projects, which reduced expenses.

Total consolidated assets rose by 49 million Swiss francs (2 percent) to 3,140 million Swiss francs at the end of 2021. Consolidated liabilities were down by 263 million Swiss francs on the previous year to 1,361 million Swiss francs. This was due primarily to the reduction in the net defined benefit liability to 286 million Swiss francs (a decrease of 229 million Swiss francs), which was attributable, in turn, to higher gains on plan assets and net actuarial gains.

In the reporting period, the structure of and the accounting for equity were changed. This involved making reclassifications between the various line items in equity so as to make clear the difference between reserves with an externally specified purpose and reserves with an internally specified purpose. It also involved restating prior-year amounts. Consolidated equity rose by 312 million Swiss francs to 1,780 million Swiss francs as at 31 December 2021. The change was mostly the result of the rise in valuation reserves (which were up by 218 million Swiss francs) due to the above-mentioned remeasurement of the net defined benefit liability. Donations, grants, co-financing rose by 44 million Swiss francs compared with the restated prior-year amount, mainly because new donation agreements signed exceeded funds used, but also because of the positive performance of the asset management mandates. Reserves with internal dedication were down by 30 million Swiss francs on the restated prior-year amount due to the use of funds on teaching and research projects. Reserves without dedication showed a decline of 56 million Swiss francs. This reduction primarily reflected the additional funds required but not covered by the total federal contribution in the course of operating activities. The change also reflected use on the projects funded from those reserves.

As a result of these effects, the reported equity ratio rose from 47 percent in the previous year to 57 percent at the end of 2021.

CONSOLIDATED FINANCIAL STATEMENTS

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	2021	2020
Federal financial contribution		1,176	1,151
Federal contribution to accommodation		134	142
Total federal contribution	4	1,310	1,293
Tuition fees, continuing education	5	36	31
Swiss National Science Foundation (SNSF)		135	129
Swiss Innovation Agency (Innosuisse)		18	22
Special federal funding of applied research		36	25
EU Framework Programmes for Research and Innovation (EU-FPs)		81	72
Industry-oriented research (private sector)		61	60
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)		34	49
Research contributions, mandates and scientific services	6	366	356
Donations and bequests	7	89	120
Other revenue	8	37	36
Operating revenue		**1,837**	**1,835**
Personnel expenses	9	1,199	1,226
Other operating expenses	10	476	489
Depreciation	18, 20	101	95
Transfer expenses	11	27	27
Operating expenses		**1,803**	**1,837**
Operating result		**34**	**–2**
Net finance income/expense	12	**32**	**20**
Share of surplus/deficit of associated entities and joint ventures	17	**27**	**33**
Surplus (+) or deficit (–)		**94**	**51**

CONSOLIDATED BALANCE SHEET

CHF million	Note	31.12.2021	31.12.2020
Assets			
Cash and cash equivalents	13	821	914
Current receivables from non-exchange transactions	14	315	305
Current receivables from exchange transactions	14	32	34
Current financial assets and loans	19	355	323
Inventories	15	7	6
Prepaid expenses and accrued income	16	36	32
Total current assets		**1,566**	**1,614**
Property, plant and equipment	18	660	572
Intangible assets	18	4	3
Non-current receivables from non-exchange transactions	14	631	648
Non-current receivables from exchange transactions	14	–	–
Investments in associated entities and joint ventures	17	230	202
Non-current financial assets and loans	19	7	6
Co-financing	20	43	45
Total non-current assets		**1,574**	**1,476**
Total assets		**3,140**	**3,091**
Liabilities and equity			
Current liabilities	21	91	113
Current financial liabilities	22	0	0
Accrued expenses and deferred income	23	100	86
Short-term provisions	24	45	49
Short-term liabilities		237	248
Dedicated third-party funds	26	793	815
Non-current financial liabilities	22	19	19
Net defined benefit liabilities	25	286	515
Long-term provisions	24	25	27
Long-term liabilities		1,123	1,375
Total liabilities		**1,361**	**1,623**
Valuation reserves		202	–16
Reserves from associated entities	17	230	202
Donations, grants, co-financing [1]		757	713
Reserves with internal dedication [1]		419	449
Reserves without dedication [1]		114	170
Accumulated surplus (+)/deficit (–)		58	–50
Total equity		**1,780**	**1,467**
Total liabilities and equity		**3,140**	**3,091**

1 The 2020 amounts do not match the amounts published in the 2020 financial report. They were restated due to the retrospective application of a change in the accounting, with recognition in the categories of reserves newly defined in 2021. Please see the section entitled "Restatement of prior-year amounts" in 2 "Basis of accounting".

CONSOLIDATED STATEMENT OF CHANGES IN EQUITY

CHF million	Valuation reserves	Reserves from associated entities	Donations, grants, co-financing	Teaching and research reserves	Infrastructure and administration reserves	Reserves with internal dedication	Reserves without dedication	Accumulated surplus (+)/deficit (–)	Total equity
	a	b	c	d			e	f	
2021									
As of 1.1.2021	**–16**	**202**	**713**	**449**	**–**	**449**	**170**	**–50**	**1,467**
Surplus (+) or deficit (–)								94	94
Revaluation of net defined benefit liabilities	216								216
Revaluation of financial assets	2								2
Total items directly recognised in equity	218								218
Transfers in currrent period	–	28	44	–	–	–	–	–71	0
Transfer of reserves with internal dedication				–30	–	–30	30		–
Appropriation of surplus or deficit							–86	86	–
Currency translations								0	0
Total changes	**218**	**28**	**44**	**–30**	**–**	**–30**	**–56**	**108**	**312**
As of 31.12.2021	**202**	**230**	**757**	**419**	**–**	**419**	**114**	**58**	**1,780**
2020 [1]									
As of 1.1.2020	**–699**	**168**	**658**	**391**	**–**	**391**	**307**	**–92**	**733**
Surplus (+) or deficit (–)								51	51
Revaluation of net defined benefit liabilities	682								682
Revaluation of financial assets	1								1
Total items directly recognised in equity	683								683
Increase (+)/decrease (–) in reserves	–	33	55	59	–	59	–137	–9	–
Currency translations								0	0
Total changes	**683**	**33**	**55**	**59**	**–**	**59**	**–137**	**42**	**734**
As of 31.12.2020	**–16**	**202**	**713**	**449**	**–**	**449**	**170**	**–50**	**1,467**

1 The 2020 amounts do not always match the amounts published in the 2020 financial report. For further information, please see the section entitled "Restatement of prior-year amounts" in 2 "Basis of accounting".

a The positive valuation reserves (CHF 202 million as of 31 December 2021) consist predominantly of cumulative net actuarial and investment gains on the net defined benefit liability (not recognised in surplus or deficit). Details can be found in note 25.

b Reserves from associated entities comprise ETH Zurich's share of the equity of the ETH Zurich Foundation and other independent foundations. Changes primarily reflect its share of the associated entities' surplus or deficit in the reporting period (see notes 17 and 32).

c Donations, grants, co-financing rose to CHF 757 million, as new donation agreements signed exceeded funds used and because of the net income generated from asset management mandates (previous year restated: CHF 713 million). Donations, grants, co-financing are mostly subject to contractually specified conditions or have a contractually specified purpose.

d Teaching and research reserves reflected the binding commitments made internally by the Executive Board in order to promote strategic projects. These reserves fell by CHF 30 million to CHF 419 million due mainly to the use of funds on existing projects. The reserves included appointment commitments to newly appointed professors of CHF 129 million as of 31 December 2021 (previous year: CHF 131 million).

e Reserves without dedication reflect funds that originate from self-generated revenues or completed research projects that show a surplus. Reserves without dedication fell by CHF 56 million. This primarily reflected the additional funds required but not covered by the total federal contribution in the course of operating activities. The change also reflected use on the projects funded from these reserves.

f The accumulated surplus/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, increases/decreases in donations, grants, co-financing and allocations to/withdrawals from the reserves.

CONSOLIDATED CASH FLOW STATEMENT

CHF million	Note	2021	2020
Cash flows from operating activities			
Surplus (+) or deficit (–)		**94**	**51**
Depreciation	18, 20	101	95
Share of surplus/deficit of associated entities and joint ventures		–27	–33
Net finance income/expense (non-cash)		–30	–29
Increase/decrease in net working capital		–20	37
Increase/decrease in net defined benefit liabilities	25	–13	52
Increase/decrease in provisions (short- and long-term)	24	–5	–2
Increase/decrease in non-current receivables	14	20	–39
Increase/decrease in dedicated third-party funds	26	–22	40
Reclassification and other (non-cash) income		–34	–14
Cash flows from operating activities		**65**	**158**
Cash flows from investing activities			
Investments			
Purchase of property, plant and equipment	18	–154	–176
Purchase of intangible assets	18	–2	–1
Increase in co-financing	20	–	–
Increase in loans	19	0	0
Increase in current and non-current financial assets	19	–28	–67
Total investments		**–184**	**–244**
Divestments			
Disposal of property, plant and equipment	18	0	–
Disposal of intangible assets	18	–	–
Decrease in co-financing	20	–	–
Decrease in loans	19	0	–
Decrease in current and non-current financial assets	19	27	833
Total divestments		**27**	**833**
Dividends received from associated entities and joint ventures	17	–	–
Cash flows from investing activities		**–157**	**589**
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		**–93**	**747**
Cash and cash equivalents at the beginning of the period (1.1.)	13	**914**	**168**
Total cash flow		–93	747
Net effect of currency translation on cash and cash equivalents		0	0
Cash and cash equivalents at the end of the period (31.12.)	**13**	**821**	**914**
Contained in the cash flows from operating activities:			
Dividends received		5	4
Interest received		0	0
Interest paid		–1	–1

Note: In the previous year, total cash flow and the decrease in current financial assets mainly reflected the transfer of CHF 745 million of financial assets placed with the Federal Government to short-term deposits.

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 24,530 students from over 120 countries, including 4,460 doctoral students. It offers researchers an inspiring working environment and its students a comprehensive education. Twenty-two Nobel Laureates have studied, taught or conducted research and continue to conduct 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 2021 to 31 December 2021. The reporting date is 31 December 2021. 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 6.6)

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).

No new standards were adopted in the reporting period.

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 adopted in these annual consolidated financial statements. The effective date is given in brackets.

IPSAS 41	Financial Instruments; replaces IPSAS 29 (1 January 2023)
IPSAS 42	Social Benefits (1 January 2023)
Various	Improvements to IPSAS, 2019 (1 January 2023)

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.

IPSAS 41 introduces changes to the measurement, classification and impairment of financial instruments. ETH Zurich does not expect reclassification or the application of the new measurement rules to have a material impact. The introduction of the new impairment model under IPSAS 41 is likely to result in a slight increase in loss allowances on receivables. ETH Zurich plans to early adopt the standard as of 1 January 2022.

There are no further amendments or interpretations that are not yet required to be applied and that would have a material effect on ETH Zurich's financial accounting and reporting.

Restatement of prior-year amounts

In the reporting period, the structure of and the accounting for equity were changed so as to make clear the difference between reserves with an internally specified purpose and reserves with an externally specified purpose. These changes address the requirements of the owner. Funds in the "Donations, grants, co-financing" category in particular have an externally specified purpose. The funds received are used as specified by the grantor.

The realignment of the reserve categories in the reporting period takes account of this specific context. The amended accounting and recognition requirements resulted in the amounts as of 1 January 2020 and 31 December 2020 being retrospectively restated. It is solely a case of reclassification between the arious line items in equity.

Restatement of consolidated equity as of 1 January 2020

CHF million	1.1.2020 (reported)	Adjustment related to change in accounting policies	1.1.2020 (restated)
Equity			
Valuation reserves	–699	–	–699
Reserves from associated entities	168	–	168
Donations and bequests	479	–479	–
Teaching and research reserves	424	–424	–
Infrastructure and administration reserves	74	–74	–
Free reserves	331	–331	–
Co-financing	47	–47	–
Donations, grants, co-financing	–	658	658
Internally dedicated reserves for teaching and research	–	391	391
Internally dedicated reserves for infrastructure and administration	–	–	–
Reserves without dedication	–	307	307
Accumulated surplus (+)/deficit (–)	–92	–	–92
Total equity	**733**	**–**	**733**

"Donations, grants, co-financing" comprises "Donations and bequests", "Co-financing" and individual items from "Teaching and research reserves", "Infrastructure and administration reserves" and "Free reserves".

"Internally dedicated reserves for teaching and research" and "Internally dedicated reserves for infrastructure and administration" are the former "Teaching and research reserves" and "Infrastructure and administration reserves" minus the items reclassified into "Donations, grants, co-financing", plus the items reclassified out of "Free reserves".

"Reserves without dedication" are the former "Free reserves" minus the items reclassified into other categories.

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.

	Closing rate as of		Average rate	
	31.12.2021	**31.12.2020**	**2021**	**2020**
Currency				
1 EUR	1.0359	1.0817	1.0810	1.0705
1 USD	0.9107	0.8840	0.9143	0.9381
1 SGD	0.6764	0.6698	0.6803	0.6802

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 performance 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 2021, using actuarial assumptions as of 31 December 2021 (e.g. BVG 2020 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 2021. The fair value of the plan assets was used, including estimated performance as of 31 December 2021.

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.

Risk sharing is included in the measurement of the defined benefit obligation in two steps and requires additional assumptions to be made. Like the other financial and demographic assumptions, these are assumptions made from the employer perspective. In the first step, it is assumed that the pension scheme's Board of Directors (*Kassenkommission*) will continue to take measures to keep the pension scheme financially balanced and counteract any systematic redistribution between active and retired members. In doing so, it is assumed that the most likely risk-mitigation measure is to reduce the conversion rate to an actuarially appropriate level. Assuming that a technical interest rate of 1.3 percent is applied in combination with period tables, the outcome is a reduction in the conversion rate to 4.7 percent. Even after assuming the future reduction in benefits (as a result of the lower conversion rate accompanied by experience-based compensation measures), there remains a structural deficit, which in the second step is apportioned between the employer and employees. In doing so, it is assumed that the employer share of the deficit is limited to 64 percent as per the current sliding scale of savings contributions under the terms of the scheme. The employee share is allocated at a flat rate between an earned portion and a portion still to be earned, based on past and expected future years of service. The portion already earned reduces the present value of the employer's defined benefit obligation, while the portion still to be earned reduces the employer's future service cost.

Since the introduction of risk sharing, effects of plan amendments that relate to assumptions about risk sharing have no longer been recognised in the statement of financial performance, but directly in equity as a component of the remeasurement of the liability.

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.

Reserves from associated entities

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

Donations, grants, co-financing

This item includes unused third-party funds from donations, bequests and other grants that have conditions attached, but are not required to be classified as liabilities. The funds are solely funds from non-exchange transactions (IPSAS 23). The net income generated from the management of third-party funds and the reserves for fluctuations in the value of the securities portfolio (risk capital) are also allocated to this category. Further information on co-financing can be found in the section entitled Co-financing.

Reserves with internal dedication

- Teaching and research reserves: This item indicates that various internal commitments exist and appropriate reserves have been recognised to cover them. The reserves comprise reserves for teaching and research projects and include "appointment 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 delayed construction projects and for dedicated saving for specific infrastructure projects (> CHF 10 million) and administrative projects.

Reserves without dedication

Unused funds for which there are no contractual or internal provisions in accordance with IPSASs are presented as reserves without dedication. They are not restricted in terms of time or purpose.

Reserves must have been generated. They are recognised and reversed within equity.

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, increases/decreases (transfers in the reporting period) in donations, grants, co-financing and allocations to/withdrawals from the reserves (appropriation of surplus/deficit).

The surplus/deficit carried forward changes 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" including the effect of changes in foreign exchange rates on consolidation of foreign equity investments.

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, contingent assets and contingent liabilities: these involve a high degree of estimation with regard to the probability and extent of the cash inflow or outflow 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 determination of the discount rate and the future rates of salary and pension increase is a key element of the actuarial valuation, as are demographic trends (future mortality, disability, probable employee turnover) and assumptions about risk sharing between the employer and employees. 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. Due to the current interest rate situation, however, these rates are subject to a certain degree of uncertainty.

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 1,310 million in the reporting period (previous year: CHF 1,293 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 rose by CHF 25 million, or 2 percent, to CHF 1,176 million in 2021. The contribution to accommodation, which comprises the depreciation charges on buildings and the return on asset value, dropped slightly, by CHF 8 million to CHF 134 million.

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 5 million to CHF 36 million. The rise reflects the higher number of students, the moderate increase in tuition fees and the further expansion of the range of continuing education programmes.

6 Research contributions, mandates and scientific services

CHF million	2021	of which revenues (IPSAS 23)	of which revenues (IPSAS 9)	2020	Change absolute
Swiss National Science Foundation (SNSF)	135	135	–	129	6
Swiss Innovation Agency (Innosuisse)	18	18	–	22	–4
Special federal funding of applied research	36	14	22	25	11
EU Framework Programmes for Research and Innovation (EU-FPs)	81	81	–	72	9
Industry-oriented research (private sector)	61	18	43	60	1
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)	34	20	15	49	–14
Total research contributions, mandates and scientific services	**366**	**286**	**79**	**356**	**10**

Revenue from research contributions, mandates and scientific services rose slightly (CHF +10 million). The biggest increase was in revenue from federal research mandates (CHF +11 million). Revenue from EU Framework Programmes for Research and Innovation also rose (CHF +9 million). Further rises were recorded in revenue from the SNSF (CHF +6 million) and revenue from industry-oriented research (CHF +1 million). These changes primarily reflected the stage of completion of ongoing projects.

The increases in revenue mentioned above were partly offset by the decline in revenue from other project-oriented third-party funding (CHF –14 million). This reduction was attributable to the fact that a larger volume of contracts were signed in the previous year where the total contract value was reported as revenue in 2020.

Information on receivables from non-exchange transactions 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 89 million (CHF –31 million). It resulted mostly from donation agreements signed in 2021. 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 4 million, mostly in the form of rights of use.

8 Other revenue

CHF million	2021	2020	Change absolute
Licences and patents	2	2	0
Sales	7	5	2
Refunds	1	1	0
Other services	9	11	–2
Real estate revenue	9	5	3
Revenue from real estate owned by the Federal Government left for use	1	3	–2
Profit from disposals (property, plant and equipment)	0	0	0
Other miscellaneous revenue	8	8	0
Total other revenue	**37**	**36**	**1**

Other revenue rose slightly (CHF +1 million). The rise was attributable to an increase in real estate revenue, including the reduced revenue from real estate owned by the Federal Government left for use (CHF +1 million) due to the change in the method of calculation upon the entry into force of the Ordinance on the Finance and Accounting of the ETH Domain on 1 January 2021. Revenue from sales also rose (CHF +2 million) due to the sale of machinery. The rise was partly offset by lower revenue from other services (CHF –2 million), mainly the ETH Library.

9 Personnel expenses

CHF million	2021	2020	Change absolute
Professors	136	135	1
Scientific personnel	501	482	19
Technical and administrative personnel, apprentices, trainees	377	366	11
IC, Suva and other refunds	–5	–4	–1
Total salaries and wages	**1,009**	**980**	**30**
Social insurances OASI/DI/IC/MB	65	63	2
Net pension costs	108	168	–60
Accident and sickness insurance Suva (BU/NBU/KTG)	4	4	0
Employer's contribution to Family Compensation Fund (FAK/FamZG)	11	11	0
Total social insurance schemes and pension expenses	**189**	**245**	**–57**
Other employer contributions	0	0	0
Temporary personnel	0	0	0
Change in provisions for untaken leave and overtime	–4	0	–4
Change in provisions for contributions to long-service awards	–1	–4	2
Other personnel expenses	5	4	0
Total personnel expenses	**1,199**	**1,226**	**–28**

Salaries and wages increased by CHF 30 million, or 3 percent, year on year. This was related to the rise in average full-time equivalents by 320 FTEs to 10,418 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. These decreased by CHF 60 million due mainly to lower current service cost as a result of the increase in the discount rate and the initial effect of risk sharing. Further details on the net pension costs can be found in note 25.

The change in provisions for untaken leave and overtime (CHF –4 million) was mainly the result of the reduction in leave and overtime balances. Details on provisions can be found in note 24.

10 Other operating expenses

CHF million	2021	2020	Change absolute
Expenses for goods and materials	70	70	0
Premises costs	185	204	–19
Energy costs	33	30	3
IT expenses	55	60	–5
Expenses for consultations, appraisals and guest lecturers	44	41	3
Library expenses	21	19	2
Other operating costs	69	66	3
Total other operating expenses	**476**	**489**	**–13**

The decline in premises costs (CHF –19 million) was attributable primarily to lower expenses for leasehold improvements, in particular as a result of the year-on-year increase in the amount recognised as assets in the course of completing large construction projects, which reduces expenses. Premises costs also decreased as a result of lower accommodation expense for the use of property owned by the Federal Government (see note 4). Conversely, lease expenses were higher due to the rental of additional space. IT expenses also showed a decline (CHF –5 million). This was primarily the result of a decrease in expenses for infrastructure. These effects were offset mainly by a rise in energy costs (CHF +3 million) and expenses for consultations, expertise and guest lecturers (CHF +3 million). The rise primarily reflected an increase in expenses for district heating and electricity and a further increase in expenses for advisory services.

11 Transfer expenses

CHF million	2021	2020	Change absolute
Scholarships and grants to students and doctoral students	15	13	2
Contributions to research projects	5	6	–1
Other transfer expenses	7	8	–1
Total transfer expenses	**27**	**27**	**0**

12 Net finance income/expense

CHF million	2021	2020	Change absolute
Finance income			
Interest income	3	5	–2
Income from investments	6	5	1
Changes in fair value of financial assets	30	28	2
Foreign currency gains	6	4	1
Other finance income	0	0	0
Total finance income	**45**	**42**	**2**
Finance expense			
Interest expense	1	1	0
Other financing costs for provision of capital	–	–	–
Changes in fair value of financial assets	4	12	–8
Foreign currency losses	6	9	–2
Impairment of loans and fixed deposits	0	0	0
Other finance expense	1	1	0
Total finance expense	**12**	**22**	**–10**
Total net finance income/expense	**32**	**20**	**12**

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. The reduction stemmed primarily from the change in the discount rate.

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	31.12.2021	31.12.2020	Change absolute
Cash	1	1	0
Swiss Post	15	35	–21
Bank	41	33	8
Short-term deposits (<90 days)	765	845	–80
Total cash and cash equivalents	**821**	**914**	**–93**

The change in cash and cash equivalents is closely related to ETH Zurich's investing and financing activities (see "Consolidated cash flow statement") and subject to foreign currency fluctuations that are not reflected in "Total cash flow". A significant portion of "Cash and cash equivalents" comprises deposits with the Federal Government that were presented as 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.

Cash and cash equivalents declined year on year (CHF –93 million) due to a decrease in short-term deposits (CHF –80 million) and balances with Swiss Post (CHF –21 million). Bank balances show an opposite effect (CHF +8 million, of which CHF +13 million was attributable to controlled entities). Further information on controlled entities can be found in note 32.

14 Receivables

CHF million	31.12.2021	31.12.2020	Change absolute
Receivables from project contracts and donations	936	943	–8
Other receivables	10	10	0
Value adjustments	–	–	–
Total receivables from non-exchange transactions	**946**	**954**	**–8**
of which current	315	305	9
of which non-current	631	648	–17
Trade accounts receivable	21	27	–6
Other receivables	12	8	4
Value adjustments	–1	–1	0
Total receivables from exchange transactions	**32**	**34**	**–2**
of which current	32	34	–2
of which non-current	–	–	–

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 non-exchange transactions fell (CHF –8 million, of which CHF –7 million was attributable to controlled entities) due primarily to a reduction in receivables for EU projects. Conversely, receivables from Innosuisse projects and receivables from federal research mandates showed a rise.

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
31.12.2021					
Gross amount	**979**	**939**	**18**	**5**	**17**
Receivables from non-exchange transactions	946	915	11	4	16
Receivables from exchange transactions	33	24	7	1	1
Value adjustments	**–1**	**–**	**–**	**–**	**–1**
of which individually impaired	–	–	–	–	–
31.12.2020					
Gross amount	**989**	**966**	**10**	**3**	**8**
Receivables from non-exchange transactions	954	938	5	3	7
Receivables from exchange transactions	35	29	5	0	1
Value adjustments	**–1**	**–**	**–**	**–**	**–1**
of which individually impaired	–	–	–	–	–

Value adjustments on receivables

Value adjustments on receivables amounted to CHF 1 million (previous year: CHF 1 million) and related to receivables from exchange transactions.

15 Inventories

Inventories of CHF 7 million (previous year: CHF 6 million) comprise purchased inventories (there are no self-produced inventories).

16 Prepaid expenses and accrued income

CHF million	**31.12.2021**	**31.12.2020**	**Change absolute**
Interest	0	0	0
Prepaid expenses	21	18	3
Other prepaid expenses and accrued income	15	13	2
Total prepaid expenses and accrued income	**36**	**32**	**5**

This item consists mainly of the library's media purchases, advance rental payments and advance payments for hardware and software maintenance agreements as well as accrued project income that is billed and reported by reference to the stage of completion of the project.

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	Student Housing Foundation	Albert Lück Foundation [2]	Individually immaterial associated entities [3]
31.12.2021				
Reporting date used	**31.12.2021**	**31.12.2020**	**31.12.2020**	**31.12.2020**
Current assets	339	3	4	9
Non-current assets	302	121	37	5
Short-term liabilities [1]	51	1	4	0
Long-term liabilities [1]	419	56	23	3
Revenue	10	13	5	0
Tax expense	–	–	–	–
Pre-tax gain or loss attributable to discontinued operations	–	–	–	–
Surplus (+) or deficit (–)	25	5	0	0
Dividends received from the associated entity	–	–	–	–
31.12.2020				
Reporting date used	**31.12.2020**	**31.12.2019**	**31.12.2019**	**31.12.2019**
Current assets	387	6	9	9
Non-current assets	230	111	39	5
Short-term liabilities [1]	38	1	9	0
Long-term liabilities [1]	433	52	23	3
Revenue	49	13	6	0
Tax expense	–	–	–	–
Pre-tax gain or loss attributable to discontinued operations	–	–	–	–
Surplus (+) or deficit (–)	32	3	–2	1
Dividends received from the associated entity	–	–	–	–

1 The short-term and long-term liabilities of the ETH Zurich Foundation comprise capital in the form of dedicated funds and liabilities arising from grants in the amount of CHF 51 million (short-term; previous year: CHF 38 million) and CHF 419 million (long-term; previous year: CHF 433 million). These are already included in ETH Zurich's consolidated equity, where they make up a significant portion of "Donations, grants, co-financing".

2 The amounts disclosed as of 31 December 2019 include a material transaction in financial year 2020 that was therefore adjusted accordingly in the following year.

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

The "Investments in associated entities and joint ventures" and "Reserves from associated entities" items presented in the consolidated balance sheet rose from CHF 202 million to CHF 230 million. The change primarily reflected the share of surplus of associated entities in the amount of CHF 27 million in the reporting period (previous year: CHF 33 million), most notably the net finance income of 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

CHF million	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]**
2021									
Purchase value									
As of 1.1.2021	**944**	**255**	**9**	**1,208**	**322**	**178**	**500**	**1,708**	**13**
Additions	43	12	32	87	28	75	103	190	2
Reclassifications	5	–	–5	0	64	–64	–	0	0
Disposals	–59	–30	–	–90	–10	–	–10	–99	–3
As of 31.12.2021	**933**	**236**	**36**	**1,205**	**405**	**188**	**594**	**1,799**	**12**
Accumulated depreciation									
As of 1.1.2021	**791**	**215**	**–**	**1,005**	**130**	**–**	**130**	1,136	9
Depreciation	49	19	–	69	29	–	29	98	2
Impairments	–	–	–	–	–	–	–	–	–
Reversed impairments	–	–	–	–	–	–	–	–	–
Reclassifications	0	–	–	0	–	–	–	0	0
Disposals value adjustments	–59	–30	–	–89	–5	–	–5	–94	–3
As of 31.12.2021	**781**	**204**	**–**	**985**	**154**	**–**	**154**	**1,139**	**8**
Balance sheet value as of 31.12.2021	**152**	**32**	**36**	**220**	**251**	**188**	**439**	**660**	**4**
thereof leased assets					13		13	13	
2020									
Purchase value									
As of 1.1.2020	**893**	**240**	**13**	**1,145**	**286**	**117**	**404**	**1,549**	**11**
Additions	53	26	7	86	11	92	104	190	1
Reclassifications	10	0	–10	0	32	–32	–	0	0
Disposals	–12	–12	–	–23	–7	0	–7	–30	0
As of 31.12.2020	**944**	**255**	**9**	**1,208**	**322**	**178**	**500**	**1,708**	**13**
Accumulated depreciation									
As of 1.1.2020	**753**	**208**	**–**	**961**	**112**	**–**	**112**	**1,072**	**8**
Depreciation	48	19	–	67	25	–	25	92	1
Impairments	–	–	–	–	–	–	–	–	–
Reversed impairments	–	–	–	–	–	–	–	–	–
Reclassifications	0	–	–	0	–	–	–	0	0
Disposals value adjustments	–11	–12	–	–22	–6	–	–6	–28	0
As of 31.12.2020	**791**	**215**	**–**	**1,005**	**130**	**–**	**130**	**1,136**	**9**
Balance sheet value as of 31.12.2020	**153**	**40**	**9**	**203**	**192**	**178**	**370**	**572**	**3**
thereof leased assets					14		14	14	

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 mainly of technical/scientific equipment and information and communications technology (ICT) equipment.

ETH Zurich's immovable property, plant and equipment consists of five properties (CHF 17 million), one property under a finance lease (CHF 13 million) and leasehold improvements (CHF 220 million excluding assets under construction of CHF 188 million). Leasehold improvements are user-specific structural adjustments to buildings taken by ETH Zurich. As in the previous year, a large volume of leasehold improvements and assets under construction (additions) were capitalised, due mainly to the fact that construction activity remained at a high level.

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	31.12.2021	31.12.2020	Change absolute
Securities, fixed deposits and investment funds	352	323	29
Other financial assets	2	–	2
Loans	1	1	0
Total current financial assets and loans	**355**	**323**	**31**
Securities, fixed deposits and investment funds	–	–	–
Other financial assets	7	5	2
Loans	1	1	0
Total non-current financial assets and loans	**7**	**6**	**2**

Current financial assets are obtained 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.

The rise in securities, fixed deposits and investment funds was due in particular to the positive performance of the asset management mandates (CHF +29 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 0.7 million (of which CHF 0.6 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). In addition, there was still a loan to the Swiss Library Service Platform on arm's length terms. There were no material loans past due or impairment losses on loans as of 31 December 2021.

20 Co-financing

CHF million	2021	2020	Change absolute
Purchase value			
As of 1.1.	**62**	**62**	–
Additions	–	–	–
Disposals	–	–	–
As of 31.12.	**62**	**62**	**–**
Accumulated depreciation			
As of 1.1.	**17**	**16**	**2**
Depreciation	2	2	0
Disposals	–	–	–
As of 31.12.	**19**	**17**	**2**
Balance sheet value as of 31.12.	**43**	**45**	**–2**

21 Current liabilities

CHF million	31.12.2021	31.12.2020	Change absolute
Trade payables	28	36	–7
Liabilities to social insurance institutions	20	19	1
Other current liabilities	43	58	–15
Total current liabilities	**91**	**113**	**–22**

The decline in current liabilities is attributable to a decrease in other current liabilities (CHF –15 million) due to the reduction in the withholding tax liability to the cantonal tax office. There was also a fall in trade payables (CHF –7 million), which reflect the variability of accounts payable turnover.

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 15 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 2021. The change here due to repayments was a cash change.

Finance lease disclosures

CHF million	Future minimum leasing payments 2021	Future financial expenses 2021	Present value of future minimum leasing payments 2021
Due dates			
Due within 1 year	1	1	0
Due within 1 to 5 years	6	4	1
Due after more than 5 years	26	12	14
Total as of 31.12.	**33**	**17**	**16**

	2021
Leasing expenses	
Lease payments expensed in period	–
Additional details	
Future revenue from sublease (from non-cancellable contracts)	–

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

23 Accrued expenses and deferred income

CHF million	31.12.2021	31.12.2020	Change absolute
Interest	–	–	–
Deferred income	74	70	5
Other accrued expenses and deferred income	26	16	10
Total accrued expenses and deferred income	**100**	**86**	**14**

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**
2021				
As of 1.1.2021	**48**	**27**	**1**	**76**
Additions to provisions	–	3	–	3
Reversal	–4	–	–	–4
Use of provisions	–	–4	–	–4
Reclassifications	–	–	–	–
Increase in present value	–	–	–	–
As of 31.12.2021	**44**	**25**	**1**	**71**
of which short-term	44		1	45
of which long-term		25		25
2020				
As of 1.1.2020	**48**	**31**	**–**	**78**
Additions to provisions	–	–	1	1
Reversal	0	0	–	0
Use of provisions	–	–4	–	–4
Reclassifications	–	–	–	–
Increase in present value	–	–	–	–
As of 31.12.2020	**48**	**27**	**1**	**76**
of which short-term	48		1	49
of which long-term		27		27

Provisions for untaken leave and overtime (CHF 44 million) declined year on year due primarily to a reduction in leave and overtime balances. Provisions for other long-term employee benefits in accordance with IPSAS 39 (CHF 25 million) contained loyalty bonuses and decreased partly as a result of actuarial gains attributable to a change in demographic and financial assumptions.

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 Pension Ordinance (BVV 2) 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 BVV 2, was 109.3 percent at the end of the year (2020: 107.9 percent, definitive). The provisional economic funding ratio for the ETH Domain's pension scheme at PUBLICA was 96.5 percent at the end of the year (2020: 88.9 percent, definitive).

Special events

In the current reporting period, it was decided to reduce the employer's share in funding the bridging pension in accordance with the revised provisions contained in the Personnel Ordinance for the ETH Domain. This change is included in the measurement of the net defined benefit liability as negative past service cost.

Apart from this, there were no plan amendments, plan curtailments or plan settlements required to be reflected.

In line with the risk sharing between the employer and employees, only the portion of the defined benefit liability assumed to be payable by the employer was included as of 31 December 2020. This results in a more realistic picture of the pension scheme costs expected to be incurred by ETH Zurich. Including risk sharing in the measurement resulted in a CHF 152 million reduction in net defined benefit liabilities as of 31 December 2020. As a change in estimate, this reduction was recognised directly in equity within actuarial gains and losses.

In addition, as of 31 December 2020, the discount rate was for the first time linked to the yield on high-quality fixed-rate corporate bonds. As a change in accounting estimate, this change was also recognised directly in equity (valuation reserves).

Net defined benefit liabilities

CHF million	31.12.2021	31.12.2020	Change absolute
Present value of defined benefit obligations	–4,188	–4,249	60
Fair value of plan assets	3,902	3,734	168
Recognised net defined benefit liabilities	**–286**	**–515**	**229**

The CHF 229 million decrease in net defined benefit liabilities was the result of a reduction in the present value of the defined benefit obligations and an increase in the fair value of the plan assets. The change in financial assumptions, primarily the increase in the discount rate (31 December 2021: 0.4 percent; 31 December 2020: 0.2 percent), and the change in demographic assumptions reduced the net defined benefit liability by CHF 73 million and CHF 118 million, respectively. Set against this were experience losses of CHF 124 million. The plan assets increased by CHF 168 million due especially to the positive return on investments.

Net pension costs

CHF million	2021	2020	Change absolute
Current service cost (employer)	108	163	–55
Past service cost	–3	5	–8
Gains (–)/losses (+) from plan settlements	–	–	–
Interest expense from defined benefit obligations	8	–9	18
Interest income from plan assets	–7	7	–15
Administrative costs (excl. asset management costs)	2	2	0
Other	–	–	–
Total net pension costs incl. interest expense recognised in statement of financial performance	**108**	**168**	**–60**

ETH Zurich's net pension costs amounted to CHF 108 million for the reporting period (CHF –60 million). The decrease was mainly attributable to lower current service cost (CHF –55 million) and negative past service cost (CHF –8 million). Current service cost was lower due to the increase in the discount rate (1 January 2021: 0.2 percent versus 1 January 2020: –0.2 percent) and the initial effect of the risk sharing features in the statement of financial performance. Risk sharing had no impact on prior-year net pension costs, as it was implemented for the first time as of 31 December 2020.

Past service cost of CHF –3 million included purchases into the pension plan for professors (CHF 3 million) and a reduction due to the amended Personnel Ordinance for the ETH Domain. In the current reporting period, it was decided to reduce the employer's share in funding the bridging pensions. This change was included in the calculations as negative past service cost in the amount of CHF –6 million.

Due to the positive discount rate, unwinding of the discount on the defined benefit obligations resulted in interest expense in the reporting period (previous year: interest income due to negative discount rate).

The ETH Board did not transfer any contributions to the ETH Domain's pension scheme in the reporting period (previous year: none). Employer contributions of CHF 118 million and employee contributions of CHF 65 million are expected for the coming financial year.

Revaluation recognised in equity

CHF million	31.12.2021	31.12.2020	Change absolute
Actuarial gains (–)/losses (+)	–67	–510	443
from change in financial assumptions	–73	–423	350
from change in demographic assumptions	–118	–146	28
from experience adjustments	124	59	66
Return on plan assets (excl. interest income), (gains [–]/losses [+])	–149	–172	23
Other	–	–	–
Revaluation recognised in equity	**–216**	**–682**	**466**
Cumulative amount of revaluation recognised in equity (gain [–]/loss [+])	**–197**	**19**	**–216**

A revaluation gain of CHF 216 million was recognised in equity in the reporting period (2020: CHF 682 million). This resulted in a cumulative gain of CHF 197 million as of 31 December 2021 (2020: cumulative loss of CHF 19 million).

The actuarial gains attributable to the change in financial assumptions (CHF –73 million) were mainly the result of the increase in the discount rate. They were diminished slightly by the higher return on retirement savings and the reduction in the expected rate of salary increase. The change in demographic assumptions in line with the technical basis provided by BVG 2020 resulted in actuarial gains of CHF 118 million. Conversely, experience losses reduced the revaluation gains recognised in equity by CHF 124 million.

The return on plan assets recognised in equity was due to the higher earned return on investments of over 4.5 percent compared with the expected return on plan assets (which equates to a discount rate of 0.2 percent).

Change in the present value of defined benefit obligations

CHF million	2021	2020	Change absolute
Present value of defined benefit obligations as of 1.1.	**4,249**	**4,704**	**–456**
Current service cost (employer)	108	163	–55
Interest expense from defined benefit obligations	8	–9	18
Employee contributions	66	64	2
Benefits paid in (+) and paid out (–)	–173	–168	–5
Past service cost	–3	5	–8
Gains (–)/losses (+) from plan settlements	–	–	–
Actuarial gains (–)/losses (+)	–67	–510	443
Other	–	–	–
Present value of defined benefit obligations as of 31.12.	**4,188**	**4,249**	**–60**

The weighted average duration of the defined benefit obligations was 13.3 years as of 31 December 2021 (previous year: 14.0 years).

Change in the fair value of plan assets

CHF million	2021	2020	Change absolute
Fair value of plan assets as of 1.1.	**3,734**	**3,559**	**175**
Interest income from plan assets	7	–7	15
Employer contributions	121	116	5
Employee contributions	66	64	2
Benefits paid in (+) and paid out (–)	–173	–168	–5
Gains (+)/losses (–) from plan settlements	–	–	–
Administrative costs (excl. asset management costs)	–2	–2	0
Return on plan assets (excl. interest income), (gains [+]/losses [–])	149	172	–23
Other	–	–	–
Fair value of plan assets as of 31.12.	**3,902**	**3,734**	**168**

Reconciliation of net defined benefit liabilities

CHF million	2021	2020	Change absolute
Net defined benefit liabilities per 1.1.	**–515**	**–1,145**	**630**
Net pension costs incl. interest expense recognised in statement of financial performance	–108	–168	60
Revaluation recognised in equity	216	682	–466
Employer contributions	121	116	5
Obligations paid directly by the entity	–	–	–
Other	–	–	–
Net defined benefit liabilities per 31.12.	**–286**	**–515**	**229**

Major categories of plan assets

In %	31.12.2021	Listed	Not listed	31.12.2020	Listed	Not listed
Liquidity	3	3	–	3	3	–
Bonds (in CHF) Confederation	5	5	–	6	6	–
Bonds (in CHF) excl. Confederation	9	9	–	10	10	–
Government bonds (in foreign currencies)	23	23	–	25	25	–
Corporate bonds (in foreign currencies)	9	9	–	10	10	–
Mortgages	2	2	–	1	1	–
Shares	28	28	–	26	26	–
Real estate	12	6	6	10	4	6
Commodities	2	2	–	2	2	–
Other	7	–	7	7	–	7
Total plan assets	**100**	**87**	**13**	**100**	**87**	**13**

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 %	2021	2020	Change absolute
Discount rate per 1.1.	0.20	–0.20	0.40
Discount rate per 31.12.	0.40	0.20	0.20
Expected salary development	0.60	0.40	0.20
Expected pension development	0.00	0.00	0.00
Interest on retirement savings	0.40	0.30	0.10
Share of employee contribution to funding gap	36.00	36.00	0.00
Life expectancy at age 65 – women (no. of years)	24.37	24.76	–0.39
Life expectancy at age 65 – men (no. of years)	22.57	22.72	–0.15

The discount rate is linked to the yield on high-quality fixed-rate corporate bonds 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 employee share of the shortfall in funding is based on the current sliding scale of savings contributions under the terms of the scheme. The generation tables in BVG 2020 (previous year: BVG 2015) are applied for assumptions about life expectancy.

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

CHF million	Increase in assumption 2021	Decrease in assumption 2021	Increase in assumption 2020	Decrease in assumption 2020
Discount rate (change +/– 0.25 %)	–100	106	–111	118
Expected salary development (change +/– 0.25 %)	11	–11	11	–11
Expected pension development (change +/– 0.25 %)	81	n.a.	92	n.a.
Share of employee contribution to funding gap (change +/– 10%)	–15	15	–45	45
Interest on retirement savings (change +/– 0.25 %)	21	–21	20	–20
Life expectancy (change +/– 1 year)	116	–117	118	–120

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, the assumptions about salary trends and the return on retirement savings, and the employee share of the shortfall in funding were increased or reduced by fixed percentage points. The assumptions about pension trends were increased, not reduced, for the reporting period, as it is not possible to curtail pension benefits. 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	31.12.2021	31.12.2020	Change absolute
Swiss National Science Foundation (SNSF)	341	353	–11
Swiss Innovation Agency (Innosuisse)	33	28	5
EU Framework Programmes for Research and Innovation (FP)	212	249	–37
Special federal funding of applied research	35	24	11
Industry-oriented research (private sector)	33	30	3
Other project-oriented third-party funding	39	26	14
Donations and bequests	100	106	–6
Total dedicated third-party funds	**793**	**815**	**–22**

The decline in dedicated third-party funds was attributable primarily to EU projects (CHF –37 million) and related mainly to the stage of completion of ongoing projects and the smaller number of new projects. Likewise, SNSF projects declined as a result of the stage of completion of existing projects (CHF –11 million).

The main item on an upward trajectory, on the other hand, was other project-oriented third-party funding (CHF +14 million, of which CHF +5 million was attributable to controlled entities). Special federal funding of applied research (CHF +11 million) and research contributions from Innosuisse (CHF +5 million) also rose. This rise related mostly to new 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.

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
31.12.2021							
Cash and cash equivalents	**821**	766	–	–	20	35	–
Receivables from non-exchange transactions	**946**	43	156	263	–	–	484
Receivables from exchange transactions	**32**	4	–	–	0	–	27
Financial assets and loans	**362**	–	–	–	–	16	346
Prepaid expenses and accrued income	**15**	–	–	–	–	0	15
Total	**2,176**	**813**	**156**	**263**	**20**	**51**	**872**
Total prior period	**2,244**	**888**	**190**	**261**	**26**	**52**	**828**

1 The remaining receivables due from the Federal Government (State Secretariat for Education, Research and Innovation [SERI]) under the Horizon 2020 and Horizon Europe bridge financing programmes 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
31.12.2021					
Non-derivative financial liabilities					
Current liabilities	91	91	91	–	–
Leasing liabilities	16	33	1	6	26
Financial liabilities	3	3	0	2	1
Accrued expenses and deferred income	26	26	26	–	–
Derivative financial liabilities	**–**	**–**	**–**	**–**	**–**
Total	**136**	**153**	**119**	**8**	**27**
Total prior period	**148**	**166**	**131**	**7**	**29**

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 8 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-percent decrease in price would have a negative impact on surplus or deficit of CHF 33 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. The value-at-risk approach is used to determine risk tolerance. The investment strategy and the amount of assets invested must be chosen such that there is sufficient risk capital available, or sufficient risk capital can be built up, to cover the value at risk calculated.

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
31.12.2021					
Net currency balance	**1,856**	**1,809**	**10**	**7**	**30**
Sensitivity affecting financial performance +/– 10 %			1	1	3
Closing rate			1.0359	0.9107	
31.12.2020					
Net currency balance	**1,882**	**1,844**	**8**	**3**	**27**
Sensitivity affecting financial performance +/– 10 %			1	0	3
Closing rate			1.0817	0.8840	

The net currency balance for the EUR and USD categories related primarily to liquid funds and current liabilities. The net currency balance for other currencies was CHF 30 million and related primarily to asset management mandates and the entity in Singapore controlled and consolidated by ETH Zurich.

Capital management

Managed capital is defined as equity excluding valuation reserves. ETH Zurich seeks to create a solid equity base. This base will enable it to ensure that the strategic objectives are implemented. 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
31.12.2021						
Cash and cash equivalents	821	821	821			
Receivables from non-exchange transactions	946	946	946			
Receivables from exchange transactions	32	32	32			
Financial assets and loans	362	362	1	354	7	
Prepaid expenses and accrued income	15	15	15			
Financial liabilities [1]	136	136		–		136
31.12.2020						
Financial assets (in a broader sense) [2]	2,244	2,244	1,916	323	5	
Financial liabilities [1]	148	148		–		148

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
31.12.2021				
Financial assets	361	352	2	7
Financial liabilities	–	–	–	–
31.12.2020				
Financial assets	328	323	–	5
Financial liabilities	–	–	–	–

Net surplus or deficit by category

CHF million	Loans and receivables	At fair value through surplus or deficit	Available for sale	Financial liabilities
2021				
Interest income (+)/interest expense (–)	3	0		–1
Income from investments		5	–	
Change in fair value		26		
Currency translation differences, net	–3	2		–
Impairments	0		–	
Reversal of impairment	–			
Gains and losses reclassified from equity to the statement of financial performance			1	
Net surplus or deficit recorded in the statement of financial performance	**0**	**34**	**1**	**–1**
Net surplus or deficit recognised in equity			**2**	
Total net surplus or deficit by category	**0**	**34**	**3**	**–1**
2020				
Total net surplus or deficit by category	**1**	**21**	**1**	**–1**

Fair value changes (CHF 26 million) had the biggest impact on net surplus or deficit (see note 12).

28 Contingent liabilities and contingent assets

Contingent liabilities

At the end of 2021, there was a contingent liability of CHF 1 million (previous year: CHF 1 million) related to expenses incurred by contracting parties which may have to be reimbursed to those parties.

In addition, there were contingent liabilities in the low single-digit millions which cannot be measured reliably. These are attributable to a potential legal dispute and the associated costs.

Contingent assets

As in the previous year, there were no quantifiable contingent assets at the end of 2021.

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.

29 Financial commitments

CHF million	31.12.2021	31.12.2020	Change absolute
Financial commitments up to 1 year	8	4	4
Financial commitments from 1 to 5 years	74	10	64
Financial commitments > 5 years	–	–	–
No due date/indefinite	–	–	–
Total financial commitments	**81**	**13**	**68**

At the end of 2021, there were financial commitments amounting to CHF 81 million. These related mainly to the acquisition of technical/scientific equipment, primarily for a purchase planned for the CSCS (supercomputer), and to commitments from the ETH library for access to digital publications.

30 Operating leases

CHF million	2021	2020	Change absolute
Due dates			
Due within 1 year	32	33	–1
Due within 1 to 5 years	85	91	–6
Due after more than 5 years	88	88	0
Future minimum payments for non-cancellable operating lease as of 31.12.	**205**	**212**	**–7**
Leasing payments of current period	**35**	**31**	**3**
Additional details			
Return from subleasing [1]	2	1	0
Future revenue from sublease (from non-cancellable contracts)	1	2	0

1 In the 2020 financial report, payments from subleasing were presented within leasing payments of current period.

Operating leases relate mainly to rental agreements and to a lesser extent to IT licences.

31 Remuneration of key management personnel

The key management personnel of ETH Zurich are the seven members of the Executive Board. The remuneration is disclosed in the section 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
						31.12.2021		
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	31.03.2021
Rübel Geobotanical Research Institute Foundation [1]	Foundation	Promoting geobotanical science (plant sociology, plant ecology, plant distribution, vegetation history).	Zurich	CHF	Switzerland	57	100	31.12.2020

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	31.12.2021	of which ETH Singapore SEC Ltd.	of which Rübel Geobotanical Research Institute Foundation	31.12.2020
Current assets	22	18	4	16
Non-current assets	3	1	3	3
Short-term liabilities	2	2	0	1
Long-term liabilities	20	17	3	14
Revenue	9	9	0	12
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]	
						31.12.2021	
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	25	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	17	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	25	100

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

2 As in the previous year, except in the case of the Student Housing Foundation (previous year: 22 percent of voting rights) and the Albert Lück Foundation (previous year: 20 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:

	31.12.2021	31.12.2020
Controlled entities		
Quantity	5	5
Total assets (CHF million)	13	14
Associated entities		
Quantity	5	5
Total assets (CHF million)	13	14

33 Events after the reporting date

ETH Zurich's financial statements were authorised for issue by ETH Zurich's President and Vice President for Finance and Controlling on 28 February 2022. 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 2021.

EIDGENÖSSISCHE FINANZKONTROLLE
CONTRÔLE FÉDÉRAL DES FINANCES
CONTROLLO FEDERALE DELLE FINANZE
SWISS FEDERAL AUDIT OFFICE

Reg. Nr. 934.21465.004

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 2021, the consolidated balance sheet as of 31 December 2021, 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 73 to 111) present fairly, in all material respects, the consolidated financial position of the ETH Zurich as of 31 December 2021, 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 Audit Office 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 Audit Office 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, 28 February 2022 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 Switzerland
Accenture
AdNovum Informatik
Alibaba
AMAG Group AG
Amazon
Apple
ARM
ASML
Avaloq
AXA
AXA Research Fund
BASF Switzerland Research Foundation
Basler & Hofmann
Bühler
Clariant
Coop
Credit Suisse Asset Management Switzerland Ltd
Diamondscull AG
die Mobiliar
Swiss Post
dormakaba
Ebay
EKZ
ETEL
F. Hoffmann-La Roche
Facebook Technologies, LLC
fenaco
Franke
Geberit
General Electric
Givaudan
Glencore
Google
Hector Fellow Academy
Hewlett Packard Enterprise
Hexagon
Hilti
Hocoma
Holcim (Schweiz)
Huawei Technologies
Implenia
Intel
International Fine Particle Research Institute, Inc.
Joyo Technology PTE
KPMG
La Prairie
Holcim
Max Pfister Baubüro AG
Microsoft
Migros
Nestlé
Novi Financial
NZZ
Open Systems
Oracle
Petrofer
PG3 AG
Philips
PingCAP
Plastic Omnium
Plexim
Qualcomm Technologies Inc.
Repower
Ringier
SABIC
SAP SE
SBB
Sensirion
Shell
Siemens
SIX Group
SRG SSR
Sulzer
SUVA
Swisscom
Syngenta
The Microbiota Vault Inc.
TX Group AG
VMware
V-ZUG/Metall Zug
Whale Microelectronics
XILINX, Inc.
Zürcher Kantonalbank
Zurich Insurance Company
ZurichEye

Foundations und organisations

Adrian Weiss Stiftung
Age-Stiftung
Albert Lück-Stiftung
Alexander Tutsek-Stiftung
Alfred und Anneliese Sutter-Stöttner Stiftung
AO Foundation
Arbeitsgemeinschaft Prof. Hugel
Arthur Waser Stiftung
Asuera Stiftung
Bärbel und Paul Geissbühler Stiftung
Baugarten Stiftung
Béatrice Ederer-Weber Stiftung
Bernina Initiative
BNP Paribas Foundation
Bundesamt für Energie BFE
Caritatis Stiftung
Christian Martin Stiftung
Christian Solidarity International (CSI)
Clariant Foundation
ClimateWorks Foundation
Credit Suisse Foundation
Crop Productivity Foundation
Dätwyler Stiftung
DOB Ecology Stiftung
Donald C Cooper Trust
Dr. iur. Jstvan Kertész Stiftung
Drosos Stiftung
EBGB
EPFZ- GEP Chapter Geneva
Ernst Göhner Stiftung
ETH Juniors
Evi Diethelm-Winteler-Stiftung
Fondation Alcea
Fondation Botnar
Fondation Claude et Giuliana
Fondation Dr Corinne Schuler
Fondation Lopez-Loreta
Fondation Merac
Fondation Sur-la-Croix
Gebauer Stiftung
Gebert Rüf Stiftung
Gemeinnützige Stiftung Basler & Hofmann
Gemeinnütziger Fonds des Kantons Zürich
Georg und Bertha Schwyzer-Winiker Stiftung
Gordon and Betty Moore Foundation
Hasler Stiftung
Hauser-Stiftung
Heidi Ras Stiftung
Helmut Horten Stiftung
Heubergstiftung
Hilti Family Foundation
Hirschmann-Stiftung
Husson Halabi Yassir Stiftung
IMG Stiftung
Institut für bauwissenschaftliche Forschung Stiftung Kollbrunner/Rodio
International Panel on Chemical Pollution
Iodine Global Network
Jacobs Foundation
James S. McDonnell Foundation
Klostermann-Stiftung
Krebsforschung Schweiz
Krebsliga Schweiz
Kühne-Stiftung
Leister Stiftung
Lindt Cocoa Foundation
Lotte und Adolf Hotz-Sprenger Stiftung
Mary und Hermann Levin Goldschmidt-Bollag Fonds der Stiftung Archiv für Zeitgeschichte
Mäxi-Stiftung
MBF Foundation
Michael Kohn-Stiftung
Misrock-Stiftung
Monique Dornonville de la Cour - Stiftung
NOMIS Foundation
Novartis Forschungsstiftung
Novartis Institutes for Biomedical Research
Novartis Stiftung für medizinisch-biologische Forschung
Opo-Stiftung
Otto Naegeli Stiftung
Palmary Foundation
Parkinson Schweiz
Peter Bockhoff Stiftung
Peter und Traudl Engelhorn Stiftung
pharmaSuisse
Plant-for-the-Planet
Prof. Otto Beisheim-Stiftung
Promedica Stiftung
Ralf-Loddenkemper-Stiftung
René und Susanne Braginsky-Stiftung
Ricola Foundation
Rudolf Chaudoire Stiftung
Rütli Stiftung
Sawiris Foundation for Social Development
Schweizer Paraplegiker-Stiftung
Schweizerische Herzstiftung
Schweizerische Hirnliga
Schweizerische Multiple Sklerose Gesellschaft
Schweizerischer Arbeitgeberverband
SCOR Corporate Foundation
SCS Swiss Child Support Foundation
Second Mile Stiftung
Simon und Hildegard Rothschild-Stiftung
Simons Foundation
Spendenstiftung Bank Vontobel
State Secretariat for Economic Affairs SECO
Starr International Foundation
Stavros Niarchos Foundation
ACCENTUS Foundation, Verena Guggisberg-Lüthi Fonds
Stiftung für naturwissenschaftliche und technische Forschung (SFNTF)
Stiftung Mercator Schweiz
Stiftung Propter Homines
Stiftung Synapsis – Alzheimer Forschung Schweiz
Stiftung zur Förderung der Ernährungsforschung in der Schweiz
SWF Stiftung für wissenschaftliche Forschung
swisselectric
Swiss 3R Competence Centre
Swiss Philanthropy Foundation
Swiss Re Foundation
The Cogito Foundation
Udo Keller Stiftung
Uniscientia Stiftung
Ursula Himmel-Glarner Fonds zur Unterstützung herausragender Master-Studentinnen
Velux Stiftung
Verband Schweizer Medien
Victor H. und Elisabeth Umbricht-Stiftung
Volkswagenstiftung
Vontobel-Stiftung
Walder Stiftung
Walter B. Kielholz Foundation
Walter Haefner Stiftung
Wellcome Trust
Werner Siemens-Stiftung
Wilhelm Schulthess Foundation
World Economic Forum

Alumni and private donors

Giulio Anderheggen (d.)
Chris Anderson
Margrit Anliker-Rüedi (d.)
Dr Hans-Peter Bauer
Ingrid Behringer
Martin Bisang
Robert Bleibler (d.)
Simone Boehringer
Professor Alfred Büchel (d.)
Heinz M. Buhofer
Marina de Senarclens
Professor Ralph Eichler
Heinrich Fischer
Dr. Walter und Edith Fischli
André und Cornelia Frei
Walter Fust
Thomas Gut
Professor Lino Guzzella
Martin Haefner
Nils Hagander
Randolf Hanslin
Rudolf Hauser
Jürgen Hilti
Manfred Hunziker
Jacqueline Imhof
Reto Jenatsch (d.)
Walter Knabenhans
Gottlieb Knoch
Yvonne Lang-Chardonnens (d.)
Dr Moritz Lechner
Christiane Leister
Michel M. Liès
Robert Lombardini
Dr Felix and Melanie Mayer
Marina and Steffen Meister
Dr Max Meyer
Walter Meyer
Kurt Nohl
Hans Nützi
Evelyne Pflugi
Dr Markus Rauh (d.)
Dr Max Rössler
Dr Urs Saner
Eric G. Sarasin
Philippe A. Sarasin
Daniel J. Sauter
Naguib Sawiris
Peter Scartazzini
Gerhard E. Schmid
Dr Stephan and Dr Viktoria Schmidheiny
Professor Roland Siegwart
Alexandra Sprüngli-Gantenbein (d.)
Gonpo Tsering
Regula Vannod and Dr Alex Vannod (d.)
August von Finck family
Luitpold von Finck
Adrian Weiss
Professor Alexander Wokaun
Dr h.c. Hansjörg Wyss
Dr Jürg W. Ziegler

We would also like to thank the many other donors who have provided vital support to ETH and are not mentioned here by name. Donors are listed here in accordance with the ETH Zurich Code of Conduct for Handling Donations of 2 September 2014.

The ETH Foundation

Together with committed individuals, companies and foundations, the ETH Foundation promotes exceptional talent and accelerates relevant research projects at ETH Zurich in order to boost Switzerland's innovative strength and help to deliver solutions to the major challenges of our time.

► ETH Foundation:

Publisher
ETH Zurich
Design
2. stock süd netthoevel & gaberthüel
Infographics: 1kilo
Images
rubmedia AG
Project management
Andrea Lingk, ETH Zurich, and
Andrea Schmits, sda awp multimedia
Publishing team
Editorial responsibility: Rainer Borer, Maximilian Buyken, Paul Cross, Nicole Kasielke,
Roman Klingler, Katharina Kukiolka, Andrea Lingk, Anja Milz, Daniel Müller, Christoph Niedermann, Robert Perich, Katharina Poiger Ruloff, Jens Poulsen, Claudia Riegler, Cornelia Schauz, Andrea Schmits, Stephan Zimmermann
Text: Fabio Bergamin, Bettina Bhend, Vanessa Bleich, Mona Blum, Inken De Wit, Christoph Elhardt, Sheila Elsener, Bianca Gasser, Sarah Hadorn, Ralph Hofbauer, Claudia Hoffmann, Corinne Johannssen, Omar Kassab, Michael Keller, Martina Märki, Andrea Marthaler, Daniel Meierhans, Florian Meyer, Thomas Peterhans, Ori Schipper, Franziska Schmid, Norbert Staub, Michael Walther, Anne Weyden
Editing and proofreading (ETH)
Karen Rudd Gloor
Proofreading and printing
Neidhart + Schön Group
English translation
Graeme High Language Consultants Ltd.
Circulation
2,500

The Annual Report is produced in German and translated into English. Only the German version is binding.

To order copies
ETH Zurich, lager@services.ethz.ch
Contact
If you wish to make any changes to your subscription to the Annual Report, please contact:
ETH Zurich, Corporate Communications, geschaeftsbericht@hk.ethz.ch

Climate neutral
Print product
ClimatePartner.com/53232-2201-1005

FSC
www.fsc.org
MIX
Paper from responsible sources
FSC® C016003