ETH zürich

Annual report **2016**

ETH Zurich – Where the future begins

Freedom and individual responsibility, entrepreneurial spirit and open-mindedness: ETH Zurich stands on a bedrock of true Swiss values. Our university for science and technology dates back to the year 1855, when the founders of modern-day Switzerland created it as a place of innovation and knowledge. At ETH Zurich, students discover an ideal environment for independent thought, researchers a climate which inspires top performance. Situated in the heart of Europe, yet connected all over the world, ETH Zurich is developing skillful solutions to the global challenges of today and tomorrow.

19,800 students
including **4,000** doctoral students
from over **120** countries

500 professors

21 Nobel Prize winners, including Albert Einstein and Wolfgang Pauli
1 Fields Medal winner
2 Pritzker Prize winners

CHF **1.8 billion,**
comprising CHF **1.3 billion**
total contribution from
the Federal Government

355 spin-offs since 1996

90 patent applications and
200 invention disclosures
every year

9th in THE ranking
8th in QS ranking
19th in ARWU ranking

Cybathlon 2016 – a world premiere showcasing man and machine
How can modern assistive technologies make the daily lives of disabled people easier? This was the key question at the world's first Cybathlon, organised by ETH Zurich on 8 October 2016. The photo series in this annual report presents some of the competition's most moving moments.

Cover photo: New living space on campus
ETH Zurich has built five new apartment blocks to accommodate around 900 students on the Hönggerberg campus.
→ See p. 65 for details

“Universities like ETH are key players in driving change.”

Our world is changing rapidly. Digitalisation and connectivity are just two of the factors driving the technological transformation of modern society. Their impact is every bit as profound as earlier landmark innovations such as the steam engine and book printing. Although change creates many exciting opportunities, it inevitably carries risks as well.

ETH Zurich has a central role to play in the discourse on change. On the one hand, because we, as a leading technical institution, are researching scientific principles that underpin this change, in areas such as data science, machine learning and robotics.

On the other hand, because we are committed to nurturing future generations of engineers and scientists, offering them an education that not only instils strong values and a thirst for knowledge, but also trains them in critical and creative thinking. Today, this last aspect is more crucial than ever for navigating a path through this complex world. Our graduates make a direct contribution to the transfer of technical knowledge. They play an important role as leaders in industry or civil society, or as pioneers in Switzerland’s vibrant community of start-ups.

This annual report describes some of our University’s highlights and achievements during 2016. Over the course of the year there have also been several opportunities to promote ETH both at home and abroad as an institution brimming with ideas and keenly aware of its social responsibility. A personal highlight for me was the world premiere of the Cybathlon, where people with physical disabilities used advanced assistive technologies to compete in a sports tournament. The Swiss Arena in Kloten was the perfect setting for human emotions to interface with cutting-edge technology.

All these successes were made possible by the 28,000 people who study, research, teach and work at ETH Zurich. Our University has both a political and social mandate, and relies on partnerships with industry for its success. I would like to extend my special thanks to all those who continue to support us in our endeavours.

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

Lino Guzzella, President of ETH Zurich

Highlights 2016

1

1 World record for grimsel

The grimsel electric racing car has broken the world record for acceleration by an electric car. The vehicle accelerated from 0 to 100 km/h in 1,513 seconds. The record-breaking car was developed and built by students at ETH Zurich and the Lucerne University of Applied Sciences and Arts.

2

2 Cybathlon

Cybathlon enjoyed a successful world premiere: the competition organised by ETH Zurich demonstrated how advanced assistive technologies can help people with disabilities in their daily lives. Some 4,600 visitors packed into the Swiss Arena in Kloten to support 66 teams from different countries in this sell-out event.

3 ETH Week 2016

For the second year running, Bachelor's and Master's students from all disciplines were invited to take part in a critical thinking challenge and collectively come up with solutions. This year, 180 students working in smaller interdisciplinary groups tackled the theme of Challenging Water.

3

4 Gotthard Base Tunnel

After decades of construction work, the new Gotthard Base Tunnel was officially opened in June 2016. The world's longest railway tunnel relies not only on the expertise of dozens of ETH alumni, but also on the work of many ETH researchers.

4

5

5 25th anniversary of CSCS

The Swiss National Supercomputing Centre (CSCS) in Lugano celebrated its 25th anniversary in 2016. Over the same period, the supercomputer Piz Daint was updated to provide three times the computing power. This will help secure Switzerland's leading international position in computer-based research in the future.

6 Manifesta

Manifesta 11, the European Biennial of Contemporary Art, took place in Zurich in 2016. The focal point of the exhibition was the Pavilion of Reflections. The floating structure, housing a bar and cinema, was a project developed by 30 architecture students from Studio Tom Emerson at ETH Zurich.

7 Swiss Data Science Center

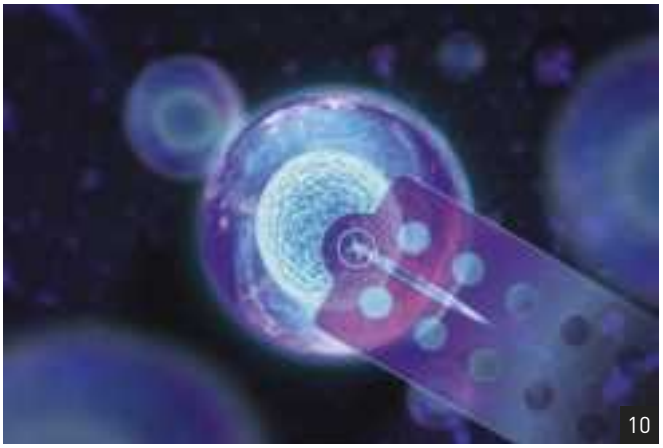
ETH Zurich and EPFL are launching a new centre for data science that will allow more efficient analysis of the growing volumes of data in the academic and scientific community. The new Swiss Data Science Center will pursue a multidisciplinary approach.

8 CeBIT

German Chancellor Angela Merkel and Johann Schneider-Ammann, Swiss Federal Councillor and President at the time, visited the ETH Zurich stand at CeBIT 2016. ETH President Lino Guzzella personally introduced the political leaders to two recent examples of ETH research.

9 Arch_Tec_Lab

In September 2016, ETH opened the Arch_Tec_Lab on the Hönggerberg campus. The new laboratory offers real-world conditions to demonstrate how digital technologies and collaborative planning processes can contribute to resource-efficient and spatially compact construction.



10 Single cell biology

ETH researchers have continued to refine the "nanosyringe" FluidFM, the world's smallest injection system. This technique allows for applications ranging from 3D printing of microscopic objects to single cell biology.

11 ESA BIC Switzerland

ETH Zurich was awarded the contract by the European Space Agency (ESA) for the ESA Business Incubation Centre (BIC) Switzerland. The first three start-ups selected for the new programme take technology from space research and transform it for use in society and business.

“After I finish my studies, I’d like to work in **Switzerland**. The local job market offers plenty of **great opportunities** for career development.”

Nino Birrer, Master’s student, Civil Engineering

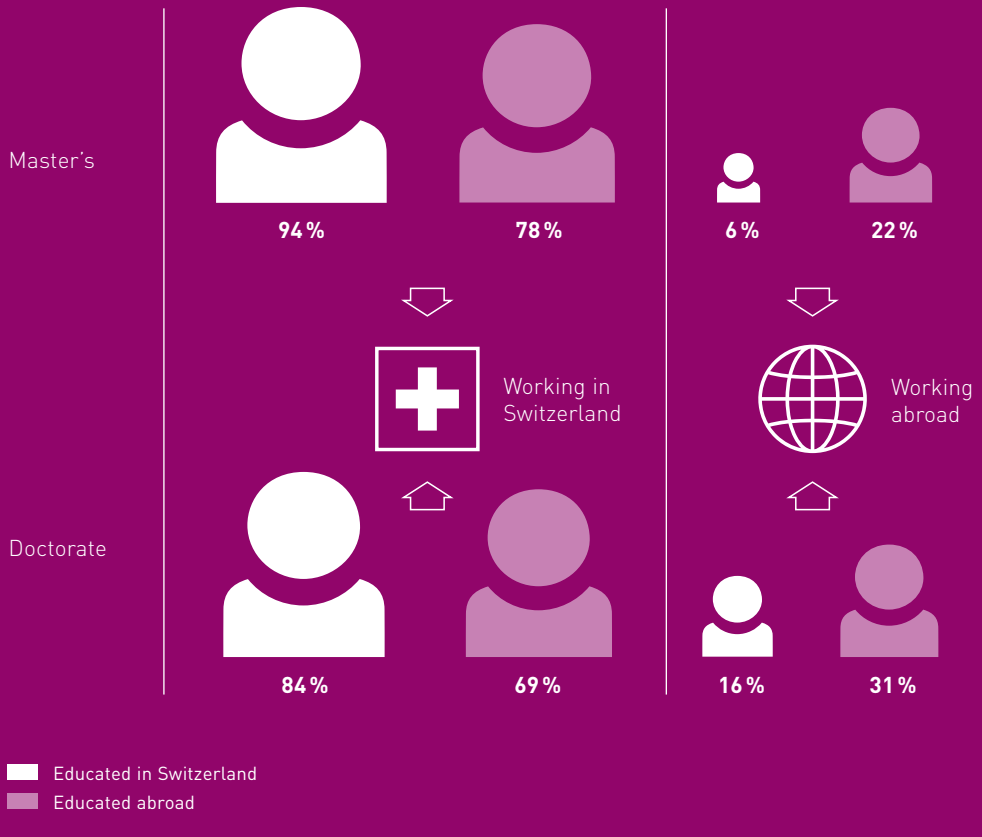
Teaching

The steady rise in the number of students attending ETH Zurich is testament to its popularity as a place of study. This success is partly down to the fact that the University never stops asking itself which knowledge and skills it should impart to students. The Executive Board has published two key documents – the Teaching Policy and Quality in Teaching at ETH Zurich – which set out the guiding values intended to shape the development of teaching at our institution. At the same time, ETH Zurich is exploring new avenues in continuing education. A roadmap on this topic explains how ETH Zurich plans to enhance its diverse programme of studies going forward.

In particular, ETH wants to expand its course content in two important areas: starting in Autumn Semester 2017, 100 Bachelor's students will be able to take a new type of course that combines medical studies with natural sciences. In addition, the University is offering two Certificate of Advanced Studies (CAS) courses in public governance and public administration, run by the recently established Swiss School of Public Governance.

Workplace of students leaving ETH with a Master's degree or doctorate, by country of education

2015 survey by Swiss Federal Statistical Office (= 2014 graduates)



PRINCIPLES OF TEACHING DEVELOPMENT

Knowledge and skills for 2030

ETH Zurich has not only published a Teaching Policy and Criteria for Quality in Teaching, but has also put these principles into practice in several areas. As an academic philosophy, critical thinking shapes the way students think and act, ensuring they are well equipped for their future careers.

One of the key issues that ETH Zurich is looking to address is precisely which knowledge and skills will best prepare the future generation of students leaving ETH in 2030 with a Master's degree. Another aspect concerns the values that our graduates need to embrace to succeed in a rapidly changing world, as well as to play an active part in shaping it.

The principles underlying ETH's educational mandate and teaching objectives have not changed since the University's foundation: to educate students to a high level of expertise in the core areas of engineering, natural sciences, architecture and mathematics. Moreover, the expectation that graduates – as society's future decision-makers and opinion-formers – will actively engage with social and political issues remains as important as ever.

Innovative teaching concept: the Innovation Project for engineering students.

Think independently, act responsibly

To quote the ETH Teaching Policy adopted in October 2016: "ETH prepares students to shape the future as members of society who think independently and act responsibly." The University is continuously developing course content and teaching methods to put this principle into practice.

At the start of a course, the focus is on the academic discipline's principles and concepts. Later, there is more emphasis on project-based teaching formats, critical reflections on the subject, or teamwork by interdisciplinary project groups (see p. 16 onwards). Some projects even radiate across the entire city and beyond, such as the Pavilion of Reflections, a floating structure designed by ETH architectural students for the European Biennial of Contemporary Art, Manifesta 11 (see p. 36).

ETH created an open space for student initiatives in 2016: the Pilot Station the Student Project House. This building on the Hönggerberg campus provides plenty of space for students to experiment with their own creative ideas throughout the year.

Creative freedom

The Teaching Policy outlined above lays the foundations for the development and assessment of teaching at our institution. It also provides the basis for the quality criteria – likewise adopted in the reporting year – for curricula and courses approved by the Executive Board in 2016. These guidelines underscore ETH's commitment to offer sound academic training with current research relevance and in-depth study of chosen topics.

At the same time, however, the ETH policy stresses that a university course must remain "manageable" and should provide "an optimal range of choices". Creating flexibility – and using it effectively – is therefore a major challenge for structuring our study courses over the coming years. Earth Sciences is a prime example: the course programme has been completely overhauled in the past year.

New perspectives

The curriculum of the Department of Humanities, Social and Political Sciences has also been fundamentally revised. Last year, the compulsory elective course was replaced by a new module: Science in Perspective. The new name reflects the study aim: to open up new perspectives for students in the natural and engineering sciences. Through seminars and lectures, they learn to recognise and critically question the correlations between scientific findings, technical innovations, cultural contexts, individuals and societies.

Critical thinking shapes the way students think and act, ensuring they are well equipped for their future careers.

What students actually learn, however, depends not only on the course programme but also on the incentives, the type of assessment methods and exams. Last year, ETH decided that attendance certificates would no longer be an admission requirement for examinations. A trial phase without attendance certificates was launched three years ago. Now ETH Zurich wants to strengthen other performance checks to boost students' motivation. For example, a good mark awarded for presenting a case study could boost the grade given for the end-of-semester exam.

Spreading the workload

The timing of exams also affects how students learn, and can influence study progress. This is particularly true of the first big test: first-year examinations. Evaluations of previous first years have shown that on average around 15 percent of undergraduate students abandon their studies without even sitting first-year examinations, despite regular course attendance during the semester.

From Autumn Semester 2016 onwards, undergraduate students in four departments – Computer Science, Information Technology and Electrical Engineering, Mathematics, and Physics – will be able to take their first-year exams in two separate blocks as part of a four-year pilot project. This gives students the opportunity to distribute their first-year workload more evenly. ETH hopes that this new flexible examination schedule will motivate more students to sit examinations. ■

www.ethz.ch/education

Personalised medicine is one the five main focuses of the new course.

NEW BACHELOR'S COURSE

Medical studies at ETH

Beginning in Autumn Semester 2017, ETH Zurich will be offering 100 places on its Bachelor's degree course in medicine, an innovative study programme that combines medicine with natural sciences.

Medical diagnostics, prognosis and treatment are all undergoing rapid change thanks to new developments in bioinformatics, molecular biology and imaging techniques – all disciplines in which ETH is at the forefront in both teaching and research. Now we are taking the next step: beginning in autumn 2017, ETH is offering an innovative Bachelor's course in human medicine that combines medical, clinical and natural sciences modules.

Natural sciences modules

Basic knowledge of various organs and organ systems is taught to students in collaboration with the University of Zurich. There are also natural sciences modules encompassing biology, chemistry, physics, maths and statistics. Once they have this foundation, students can then immerse themselves in the five medical modules that define the Bachelor's course. The focus of these modules is on drug discovery and personalised medicine, medical technology, medical imaging, medical informatics and public health. The programme is rounded off with a research internship at the interface of basic research and clinical application.

Partner universities for the Master's study

Once they have completed their Bachelor's degrees after three years at ETH, students transfer to one of the three partner universities for their Master's in medicine; or they have the option of completing their degrees at ETH. Cooperation with partner institutions guarantees that every graduate of the ETH Bachelor's programme will be offered a Master's place in medicine. And because the University of Zurich, University of Basel and Università della Svizzera Italiana have helped to design the ETH Bachelor's curriculum, graduates of the programme will be able to move on to their Master's degrees with no further admission requirements. Students find out at the end of their second year of study which of the universities they will be assigned to for their Master's degree. This process takes into account their individual wishes depending on academic performance and social factors.

Enhanced career prospects

Once students have completed their Master's degrees after a total of six years, they are eligible to take the Swiss federal examination in human medicine, which entitles them to practise as doctors. They can then work as doctors in a hospital (or later on in their own medical practice), or pursue careers in industry, healthcare policy, insurance or medical research. ■

www.ethz.ch/bachelor-humanmedizin

ROADMAP APPROVED

Stronger focus on continuing education

Continuing education is becoming increasingly important, not least due to the rapid pace of technological change. Last year the Executive Board approved a roadmap outlining how ETH Zurich intends to expand its very diverse offering in the area of continuing education.

ETH Zurich is well known for the high standard of its teaching and research. But perhaps fewer people are aware of the University's excellent continuing education programmes, despite the important contribution they make towards many areas of life in Switzerland. Courses such as the Certificates of Advanced Studies in Spatial Planning or Development and Cooperation are still the only study programmes available in these fields in Switzerland. ETH Zurich currently offers a total of 17 Masters of Advanced Studies (MAS), 25 shorter Certificate of Advanced Studies (CAS) and Diploma of Advanced Studies (DAS) courses, as well as some 100 continuing education courses and 25 e-learning programmes.

What's more, continuing education is becoming increasingly important: technological change and the rapid increase in knowledge in different disciplines make lifelong learning essential. As with mainstream university courses, ETH's continuing education offering is based on knowledge linked to research. These programmes also act as an efficient and effective method of knowledge and technology transfer. The boundary which still exists in some minds between education and continuing education could become increasingly blurred in future, with the two fields growing progressively closer.

Leveraging potential

In an effort to promote continuing education, the Executive Board appointed Professor Paolo Ermanni Vice-Rector for Continuing Education in 2015. Last year it also published its roadmap, to leverage the potential that continuing education offers to ETH Zurich in terms of profiling, reputation and networking.

In future, the University's continuing education offering is to be aligned more closely with the main focal areas of ETH research. Medicine is one such area. An MAS course programme is already available that focuses on the interface between medicine and physics, aimed at specialists who install and maintain high-tech medical equipment in hospitals. Talks are currently underway with University Hospital Zurich on the topic of cutting-edge medicine, an area where the competences of both institutions complement each other perfectly.

> The new roadmap is designed to leverage the potential that continuing education offers to ETH Zurich in terms of profiling, reputation and networking.

Future transport systems is another area where ETH is keen to transfer the fruits of its research into practice through the channel of continuing education. An MAS course will start in Spring Semester 2017. The focus of the interdisciplinary MAS ETH in Future Transport Systems is the development and implementation of resource-friendly transport solutions.

Contributing to industry and society

Within the University, optimal conditions are being created to ensure that teaching and continuing education will in future be seen as two sides of the same coin. This will ensure that lecturers involved in continuing education courses enjoy the same level of support, in terms of IT services and educational developers, as they do for their usual teaching activity. In future, continuing education will be given equal priority during teaching assessments and quality assurance controls.

In expanding its continuing education offering, ETH Zurich aims to focus on the needs of its stakeholders, be they alumni, companies or public bodies. But customised courses – for women returning to work after having children, for example – also form part of our University's contribution to the development of industry and society. ■

www.ethz.ch/continuing-education

The interdisciplinary MAS ETH in Future Transport Systems focuses on the development of resource-friendly transport solutions.

Both the total student population and applications for Master's programmes reached new highs at ETH Zurich.

STUDENT NUMBERS INCREASING

Growing popularity

Around 2,800 undergraduates enrolled at the University in 2016, roughly the same number as last year. Both the total student population and (international) applications for Master's programmes reached new highs.

This year 2,780 young men and women enrolled in one of the University's 23 undergraduate degree programmes, an increase of four percent on the previous year (2,669). The percentage of enrolled women increased by well over one percentage point compared with last year, and now stands at 33.0 percent. Only 12.1 percent of first-year students (compared with 11.5 percent last year) achieved their University entrance qualification in a foreign country before coming to Switzerland to study.

Information Technology ranks second

As in previous years, the most popular undergraduate course continues to be Mechanical Engineering, with 417 new students, though this number is slightly down on last year (449). The next most popular course is Information Technology, with 280 new students, continuing the accelerating trend of recent years. This year, 233 students enrolled in our Health Sciences and Technology course, closely followed by Architecture (230) and Electrical Engineering and Information Technology (227).

Master's programmes very popular

Around 95 percent of our students who complete Bachelor's degrees stay on to study for a Master's degree at ETH. They make up around two-thirds of total Master's students. The other third were graduates from other universities, mainly based abroad. In 2016, a record 957 students from other universities enrolled in Master's programmes at ETH Zurich. Over 3,300 young people applied to study on our Master's programmes. This is a new record as well, not least attributable to ETH's strong position in the international rankings.

Student population reaches new high

The total number of students enrolled at ETH Zurich again increased slightly in 2016. Including 4,010 doctoral students, 19,815 women and men were enrolled at ETH Zurich at the end of 2016, an increase of 3.0 percent on the previous year. The staff-student ratio has deteriorated slightly over the years. In 2016, one professor looked after 41 students from all categories on average (2008: 39). ■

www.ethz.ch/academic-services

SWISS SCHOOL OF PUBLIC GOVERNANCE

Teaching and research for the public sector

In 2016, ETH Zurich founded the Swiss School of Public Governance (SSPG), a teaching and research centre offering executive education programmes in public governance and public administration. The SPPG's initial academic programme will consist of two Certificates of Advanced Studies (CAS) targeted at public administration professionals from Switzerland and abroad.

The first programme, the CAS in International Policy and Advocacy, caters for representatives of Swiss governmental agencies, although the course content has a strong international focus. The main target group is mid- to senior-ranking professionals with international responsibilities, especially those working in Switzerland's public sector (federal, cantonal, and communal institutions and quasi-governmental organisations), as well as other officials with public governance functions, such as non-governmental organisations (NGOs).

The second course, CAS Public Governance and Administration, is aimed at public officials from abroad. As well as teaching practical skills, there is a strong emphasis on new technologies: for example, IT solutions that allow more efficient management of infrastructure, such as water and energy supplies, thereby conserving resources (keyword "smart cities"). The course also looks at how public administrations can improve their services with the help of "big data".

The two new CAS programmes will be offered in spring and summer 2017. ■

www.ethz.ch/sspg-en

Students and degree awards

Students	Total		Bachelor's students		Master's students		Doctoral students		MAS/MBA students		Visiting/ exchange students	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Headcount	**19,233**	**19,815**	**8,704**	**8,934**	**5,447**	**5,836**	**4,026**	**4,010**	**640**	**635**	**416**	**400**
Percentage women	30.5 %	31.1 %	30.0 %	30.7 %	29.9 %	30.5 %	30.7 %	31.2 %	40.3 %	40.3 %	32.9 %	34.3 %
Percentage international students	37.6 %	38.2 %	19.0 %	19.3 %	38.9 %	40.6 %	69.6 %	70.8 %	40.5 %	40.9 %	94.0 %	93.8 %
Total registrations	**19,754**	**20,331**	**9,117**	**9,364**	**5,450**	**5,836**	**4,031**	**4,014**	**740**	**717**	**416**	**400**
Architecture and Building Sciences	3,600	3,537	1,797	1,766	1,124	1,159	454	412	142	119	83	81
Engineering Sciences	6,839	7,065	3,354	3,403	1,973	2,137	1,349	1,365	16	15	147	145
Natural Sciences and Mathematics	4,971	5,144	2,193	2,348	1,237	1,297	1,202	1,176	233	232	106	91
System-oriented Natural Sciences	3,451	3,695	1,726	1,797	777	912	783	810	118	118	47	58
Management and Social Sciences	893	890	47	50	339	331	243	251	231	233	33	25
New students	**6,818**	**7,187**	**2,669**	**2,780**	**2,325**	**2,529**	**920**	**940**	**277**	**273**	**627**	**665**
Architecture and Building Sciences	1,237	1,166	478	456	448	440	93	74	98	68	120	128
Engineering Sciences	2,353	2,466	979	982	821	919	326	302	3	2	224	261
Natural Sciences and Mathematics	1,741	1,881	684	770	584	612	266	287	60	68	147	144
System-oriented Natural Sciences	1,167	1,348	512	553	359	458	182	215	28	28	86	94
Management and Social Sciences	320	326	16	19	113	100	53	62	88	107	50	38
Country of education												
Switzerland	13,169	13,485	7,899	8,133	3,488	3,647	1,274	1,217	478	456	30	32
EU	4,633	4,717	1,055	1,058	1,325	1,396	1,841	1,861	172	168	240	234
Rest of Europe	429	469	102	103	119	156	176	178	19	18	13	14
Asia	970	1,090	36	46	342	444	475	477	42	47	75	76
America	438	453	18	20	143	158	211	222	24	21	42	32
Africa	78	80	3	3	22	23	41	44	4	4	8	6
Australia and New Zealand	37	37	4	1	11	12	13	15	1	3	8	6

Degrees and diplomas	Total		Bachelor's degree		Master's degree		Doctorate		MAS		Teaching diploma/ MAS SHE		Teaching certificate	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Degrees	**4,425**	**4,711**	**1,564**	**1,571**	**1,879**	**2,015**	**718**	**851**	**175**	**203**	**62**	**43**	**27**	**28**
Architecture and Building Sciences	885	897	335	318	404	397	80	100	66	82	0	0	0	0
Engineering Sciences	1,316	1,466	491	524	608	691	210	246	0	0	1	0	6	5
Natural Sciences and Mathematics	1,187	1,213	402	358	512	527	237	283	2	16	34	28	0	1
System-oriented Natural Sciences	807	886	326	356	283	315	140	173	10	5	27	15	21	22
Management and Social Sciences	230	249	10	15	72	85	51	49	97	100	0	0	0	0

www.ethz.ch/studierendenstatistik

ETH AS A TALENT FACTORY

Supplying talent for the Swiss labour market

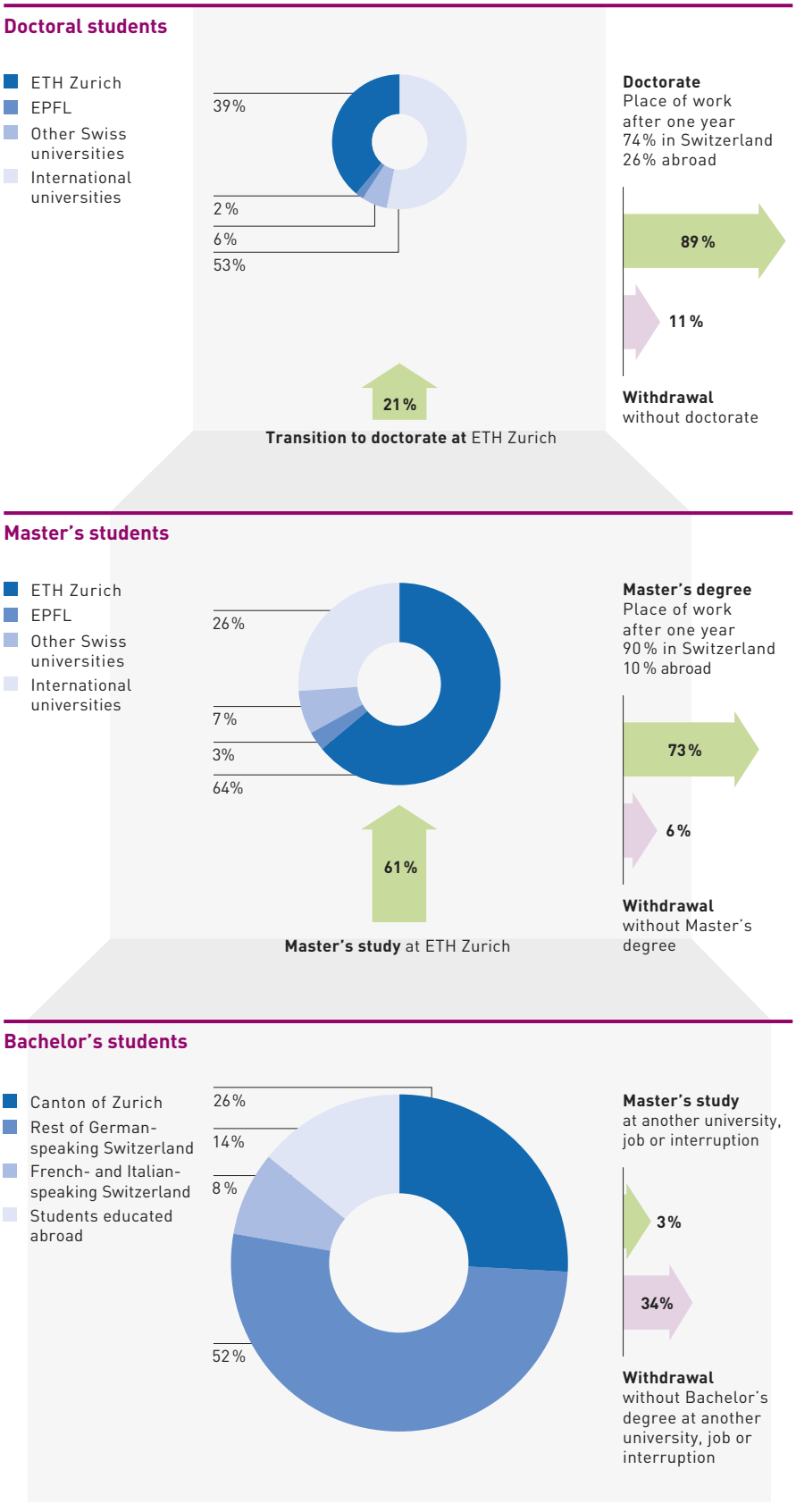
More than 8 out of 10 Bachelor's students enrolled at ETH Zurich have been through the Swiss education system. Their initial year of study at ETH is quite demanding, and culminates in first-year examinations. A third of new students leave the University without finishing their undergraduate degree, with almost half of those abandoning their studies before the first-year examinations. 90 % of all students who pass their first-year examination go on to successfully complete their Bachelor's degrees.

95 % progress to the ETH Master's course

Most ETH students who finish their Bachelor's degrees usually carry on to do a Master's course at the University, with 95 % following this progression. They account for around two-thirds of all Master's students. A quarter of students on the Master's programmes come from international universities, with more than 2,000 students from abroad applying for an ETH Master's course every year. The average period of study for completing both a Bachelor's and Master's degree is 11 semesters, while the Master's degree generally takes 4 semesters for students without a Bachelor's degree from ETH. Students on the Master's programme have a success rate of 94 %. Most of the students graduating from the University bring their knowledge and skills into the Swiss employment market. Well over a fifth of students take their education a stage further by completing their doctorates at ETH.

International doctorate

Graduates from ETH Master's programmes make up around 40 % of all doctoral students. The other 60 % or so come mainly from universities abroad. Three-quarters of doctoral students are employed as scientific staff at ETH. Around 89 % of all students successfully complete their doctoral degrees at ETH over four years on average. Although more than half of them come from abroad, 74 % go on to work in Switzerland after obtaining their doctoral degrees. ■



Student data based on the average for the period 2012–2016; study success: matriculation cohorts 2005–2009 (Bachelor's, doctoral degree) and 2006–2012 (Master's); study duration: graduating cohorts 2012–2016; graduates' place of work one year after completing their studies: average of graduates of the years 2010, 2012 and 2014 from the FSO graduate survey.

NEW WORLD RECORD

From 0 to 100 in 1.513 seconds

The Formula Student team at the Academic Motorsports Club Zurich (AMZ) has accomplished its mission: its grimsel electric racing car accelerated from 0 to 100 km/h in just 1.513 seconds, setting a new world record. The ETH team beat the previous world record held by a team from the University of Stuttgart by 0.266 seconds.

In June 2016, the vehicle reached 100 km/h after covering less than 30 metres of track at Dübendorf military airport near Zurich. The record-breaking electric car was developed and built by a team of 30 students from ETH Zurich and the Lucerne University of Applied Sciences and Arts. grimsel is AMZ's fifth electric vehicle and sets new standards in lightweight construction and electric drive technology. No mass-produced vehicle – even one with a combustion engine – can match grimsel's acceleration.

The grimsel electric racing car set a new world record for acceleration.

www.amzracing.ch

ETH WEEK 2016

Bubbling with ideas

Water was the focus of ETH Week 2016. Bachelor's and Master's students from all departments were invited to approach the subject creatively and work together to develop sustainable solutions to the challenges water presents to society.

ETH Week was held for the first time in 2015, and was so well received that it attracted even more participants in 2016. 180 students worked independently on a subject in small interdisciplinary groups, and presented their own creative solutions at the end. This year's theme was "Challenging Water".

The event is part of the Critical Thinking initiative whereby ETH Zurich promotes interdisciplinary and creative thinking. Many students are motivated to participate by the fact that their own ideas are actively sought. Rather than learning passively, they are expected and encouraged to develop something in a proactive way. This year, under the guidance of professionals and based on visits to companies and lectures given by experts, they designed solutions related to water, a key resource. The demanding technical programme was complemented by team events and sports activities.

The ActDrain 2000 group presents its concept for recycling water on balconies.

At the end of the week, all 18 of the 8- to 10-member groups presented their finished concepts to a jury. Rector Sarah Springman presented awards for the best ideas. The winning project was the concept for a device that motivates consumers to reduce their water footprint in their everyday lives. Feedback monitors installed in supermarkets show shoppers how much water they can save by purchasing a particular product. The second winning project is designed to reduce water consumption in private homes by 20 percent, by installing water recycling systems in bathrooms.

There was also the Peer-to-Peer Students Award voted on by all the participants. This prize went to a concept that allows living fish to be fitted with sensors for collecting ecological data in Swiss rivers and lakes.

www.ethz.ch/ethweek

KITE AWARD

Award for innovative teaching

ETH Zurich presented the KITE Award for the first time in April 2016. The award for innovative teaching went to Professor Mirko Meboldt, who developed a project-based course for up to 500 first-semester students.

The KITE Award was initiated by the Lecturer's Conference to honour innovative teaching concepts. KITE is short for "key innovation in teaching at ETH", but also carries an association with traditional kites, in the sense of experiments that manage to fly.

Mirko Meboldt, Professor at the Department of Mechanical and Process Engineering, won the award for his "Innovation Project" concept and associated course. Under this concept, 500 first-year students work in small independent groups to develop their own product. They are supported by student coaches from more advanced semesters, who at the same time learn the basics of leadership and coaching as part of their curriculum.

The format is characterised by critical thinking and problem-oriented, experience-based learning. Rather than acquiring knowledge about mechatronic relationships passively, students experience that knowledge hands-on through their work. In small project teams, the students work up a mechatronic system from the initial idea right through to the tested product.

Two dozen nominations

The winning project was chosen from two dozen nominations from 12 departments, beating competition from two other finalists whose focus was also on small-group and project work as opposed to "chalk-and-talk" lecture-style teaching.

In the Computer-Assisted Drug Design course run by Professor Gisbert Schneider, small groups of students form virtual firms over the course of a two-week practical block, with the aim of developing, testing and presenting a molecule with a specific pharmacological function.

The KITE Award was initiated by the Lecturer's Conference to honour innovative teaching concepts.

Professor Renate Schubert, the third finalist, has completely redesigned her "Economy" course. Scripts, videos, interactive exercises and current media reports are now provided to as many as 500 students electronically for preparatory self-study. Course participants work in small groups to develop economics arguments with sample use cases. ■

www.ethz.ch/kite-award-en

Felicitas Pauss (l.) and Sarah Springman (r.) flanking the three nominees: Gisbert Schneider, Mirko Meboldt and Renate Schubert.

GOLDEN OWL AWARDS

Outstanding lecturers honoured

Semester feedback, course assessments, student surveys: ETH is keen to hear what students think about the teaching they receive. And feedback from the students themselves is often the best way to keep standards high. For some years now, ETH Zurich's students' association VSETH has presented the Golden Owl award to recognise exceptional teaching. One lecturer per department is selected for this honour. The winners in 2016 are:

– Professor Christophe Girot (D-ARCH)
– Professor Roman Stocker (D-BAUG)
– Dr Emma Marie Caroline Wetter (D-BIOL)
– Professor Tanja Stadler (D-BSSE)
– Professor Cornelia Halin Winter (D-CHAB)
– Dr Eric Reusser (D-ERDW)
– Professor Tobias Schmidt (D-GESS)
– Dr Roland Müller (D-HEST)
– Professor Thomas Gross (D-INFK)
– Professor Laurent Vanbever (D-ITET)
– Professor Michael Ambühl (D-MTEC)
– Dr Gregor Ochsner (D-MAVT)
– Professor Walter Remo Caseri (D-MATL)
– Dr Ana Cannas da Silva (D-MATH)
– Professor Manfred Sigrist (D-PHYS)
– Professor Heini Wernli (D-USYS)

All previous winners of the Golden Owl award are automatically nominated for the Credit Suisse Award for Best Teaching, which is presented by the Credit Suisse Foundation and VSETH. This award can only be won once during the course of a teaching career. Professor John Lygeros from the Department of Information Technology and Electrical Engineering received the award in 2016. ■

www.ethz.ch/owl

“My research group brings together people of **many different nationalities**. I love the diverse mix – it’s **inspiring** and you learn a lot.”

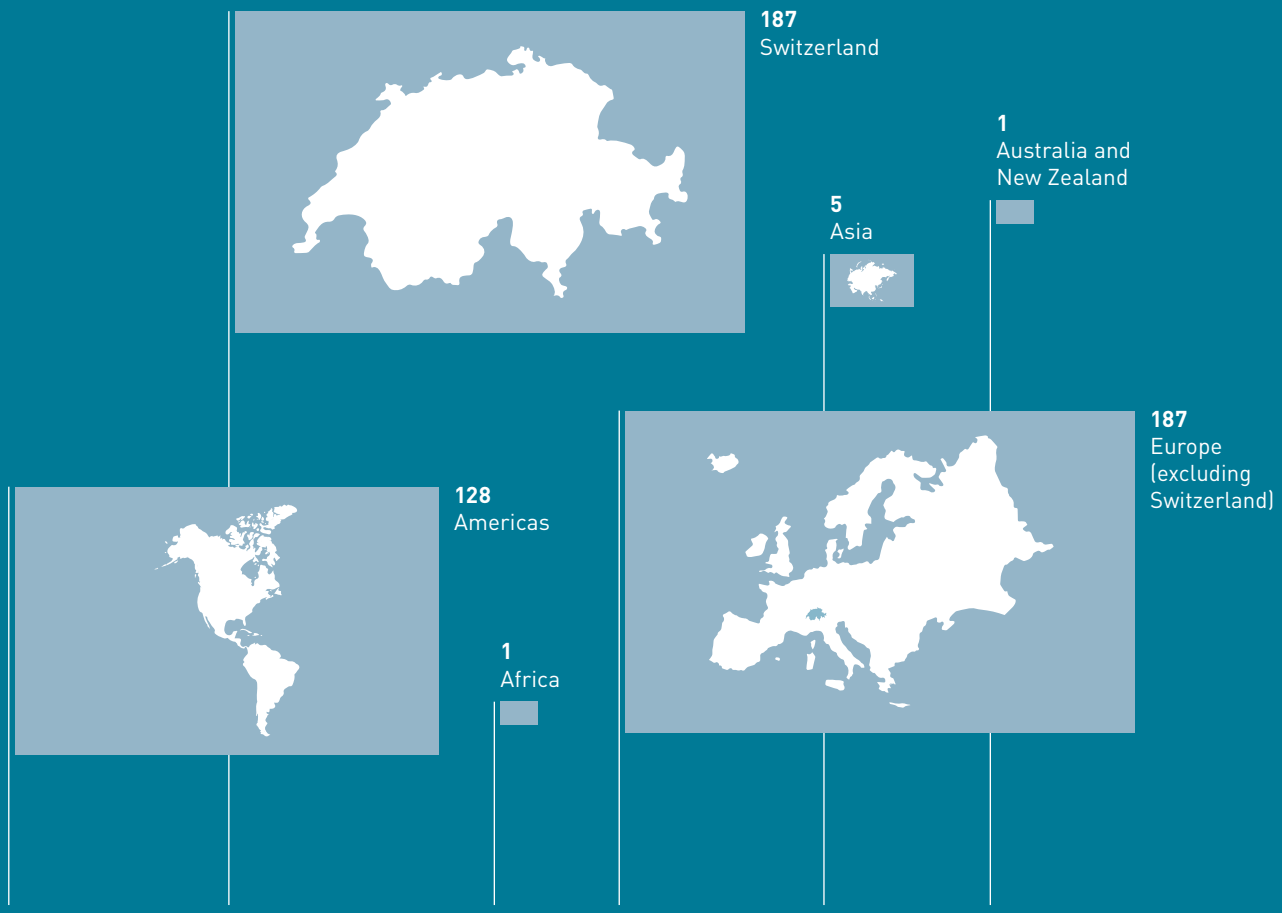
Lukas Möller, Bachelor’s student, Interdisciplinary Sciences

Research

ETH Zurich carried out further groundbreaking research in many fields during 2016. ETH scientists made important contributions to fundamental research in quantum science and astronomy, for example. They also achieved tangible results in applied research, potentially leading to new products in fields such as communication technology, materials research and biotechnology.

Cooperation with other institutions is particularly vital for successful research. With this in mind, ETH Zurich is taking part in a large-scale, interdisciplinary project run by the University Medicine Zurich organisation, aiming to pool skin research across the city. In partnership with EPFL, ETH Zurich is establishing a new centre for data science, whose mission will be to extract useful knowledge from data acquired from a range of sources. Finally, ETH Zurich plans to provide greater support for young researchers: new Career Seed Grants will enable postdoctoral students to conduct their own research projects independently of the professors they normally work under.

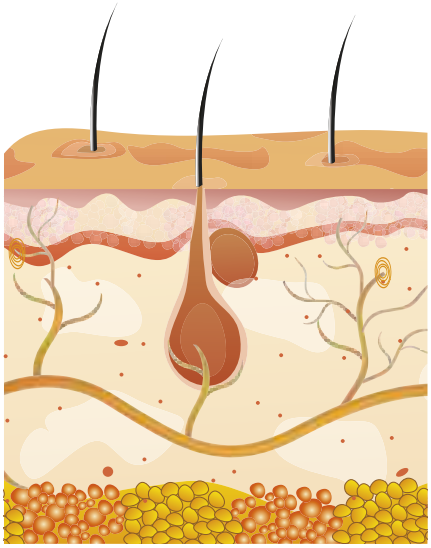
Origin of professors (as at the end of 2016)
by location of previous institution



UNIVERSITY MEDICINE ZURICH

Stepping up skin research

A new large-scale, interdisciplinary project from the University Medicine Zurich network focuses on skin research in Zurich. This will help the city become a world-class centre of research in this field.



Schematic cross-section of human skin.

ETH scientists, engineers and medics, along with ETH itself and several university clinics in Zurich, will be working together to develop new therapies and diagnostic procedures for skin diseases and tissue repair disorders, and to investigate the basic mechanisms underlying these diseases. "Skintegrity", launched on 1 October 2016, is a new flagship project of the University Medicine Zurich organisation. The project will receive 1 million Swiss francs in start-up funding, of which half will go to ETH and half to the University of Zurich. The project is led by ETH professor Sabine Werner. Lars French, Professor and Director of the Dermatology Clinic at University Hospital Zurich, is the Co-chair.

Zurich already boasts a high level of expertise in dermatology, both in fundamental research and clinical applications. The Skintegrity project plans to build on the interdisciplinary strengths of Zurich as a centre for skin research. Under the flagship project, different research teams will forge new partnerships, while existing ones will be strengthened. Another new feature is that our engineering faculty, which is especially strong at ETH Zurich, will be closely involved in the collaboration. It is hoped the project will also provide a major boost for Swiss companies in the medical technology, biotech and pharmaceutical sectors.

Skintegrity encompasses 10 sub-projects, with a total of 26 research group leaders involved. These sub-projects deliberately include some that are almost ready to be applied in practice. Skintegrity's goal is to bring some of the projects addressing therapy and diagnostics to patients within the next few years. A third mainstay of Skintegrity is fundamental research, whose aim is to develop new treatment and diagnostic approaches as part of the research project in the medium to longer term. ■

www.ethz.ch/skintegrity-en

Every scientist taking part is committed to establishing Zurich as one of the world's leading centres of skin research.

SWISS DATA SCIENCE CENTER

A new data science centre

ETH Zurich has established the new Swiss Data Science Center jointly with EPFL. With sites in Zurich and Lausanne, the centre was officially inaugurated in February 2017. The goal of data science is to acquire useful knowledge with data obtained from different sources.

Teaching and research capabilities in this area will be expanded and developed at both universities. The Swiss Data Science Center will adopt a multidisciplinary approach: specialists in data analytics and data management will work closely with experts from the areas of personalised medicine, earth sciences, environmental sciences, digital humanities and economics. New Master's programmes in Data Science will also be launched in Zurich and Lausanne in Autumn Semester 2017.

The digitalisation of all sectors of society generates growing mountains of data. But to allow data to become the "new oil", so to speak, and enable science and business to benefit from it, the data must be suitably prepared, combined and analysed. ■

www.ethrat.ch/en

ISTP RESEARCH INCUBATOR

Incubators for interdisciplinary research

ETH Zurich founded the Institute of Science, Technology and Policy (ISTP) to promote interdisciplinary teaching and research, and to address important social problems. ISTP is currently setting up three research groups.

The Urbanisation Research Incubator (URI) and the Swiss Mobility Lab were started in 2016 as part of the ISTP Research Incubator Initiative. The third research group will focus on reducing the environmental footprint of metals and mining. The aim of the initiative is to investigate and develop solutions for important societal problems at the interface of politics, science, technology and economics.

The ETH Executive Board is supporting these projects to the tune of 1 million Swiss francs each until 2020. The participating professorships will provide 50 percent of the funding for the 15 postdoctoral positions needed for this research out of their own research funds.

The professorships involved in the Urbanisation Research Incubator come primarily from the disciplines of architecture, economics, energy technology, political science and security policy. The URI is concerned with the rapid growth of medium-sized cities in developing countries and focuses on the interconnected challenges of reducing social inequality, improving public infrastructure and increasing security. The project team is specifically focused on the cities of Cape Town, Johannesburg, Bogotá, Barranquilla, Cali and Medellín.

The Swiss Mobility Lab involves professorships from the fields of energy technology, transport planning and transport systems, spatial development and political science. Beginning with the canton of Zurich, they examine how sharply increasing mobility affects quality of life, social and political engagement and the functioning of cities and towns, as well as the economy and the environment. In addition, studies, experiments and simulation models will be used to investigate how mobility demands can be sustainably addressed with a steadily growing population. ■

www.istp.ethz.ch

SUSTAINABLE CONSTRUCTION

Increasing productivity in the construction industry

The Swiss construction group Implenia is involved in establishing a new assistant professorship for innovative and industrial construction at ETH Zurich. This will help improve productivity in the construction industry, for example through novel approaches to the automation of production processes. Implenia will support the professorship over six years with funds totalling 2.4 million Swiss francs. This will further expand ETH's Sustainable Construction Initiative, under which many new professorships have been established at ETH Zurich over the past six years. ■

www.ethz.ch/donation-implenia-en
www.ethz-foundation.ch

Investing in the streamlining of construction processes.

CAREER SEED GRANTS

Start-up capital for a future career

ETH Zurich supports researchers in many different ways and at different stages of their careers. On 1 March 2016, a new funding instrument was launched for postdoctoral researchers: Career Seed Grants.

The new ETH funding instrument is intended to boost the careers of postdoctoral researchers at ETH Zurich. Career Seed Grants will enable postdoctoral researchers to carry out their own research projects independently of their professors. ETH supports projects with a one-off grant of 30,000 Swiss francs. It should therefore be possible to support 20–25 postdocs each year.

All postdoctoral researchers at ETH Zurich are eligible to apply for the grants. However, they will only be accepted if they have already produced excellent work at ETH and can demonstrate corresponding research results.

The funding instrument is open to postdocs in all 16 ETH departments and subject areas. Project ideas will be supported across the whole spectrum, ranging from basic to applied research.

The new funding instrument has been introduced at the initiative of Vice President Research and Corporate Relations Detlef Günther. It fills a gap in the range of support facilities available to promising young scientists and researchers at the beginning of their careers.

Applications for Career Seed Grants were invited over two rounds during 2016. From the number and quality of the applications received, it is already clear that the new funding programme fills a gap and will help pave the way to independent research. ■

www.ethz.ch/career-seed-grants

CLIMATE CHANGE

Two degrees just the average

For the first time, ETH researchers working with Professor Sonia Seneviratne have calculated the extreme and average temperatures and amount of rainfall that could occur in certain regions of the world as a result of climate change. The researchers developed a model and tested it in different regions, including the Mediterranean and the Arctic. The results for the Mediterranean show that, if the global average temperature increases by 2°C, the region will see mean temperatures increase by 3.4°C on average. If, however, the aim is to limit warming in the Mediterranean to 2°C, then the global temperature must rise by no more than 1.4°C. The most extreme changes could be seen in the Arctic: with global warming of 2°C, average temperatures in the far north increased by 6°C. The 2°C target for the Arctic had already been exceeded when global warming reached 0.6°C on average (this figure is now approximately 1°C). The study shows that the 2°C target cannot be met in many parts of the world, even if achieved globally. ■

www.iac.ethz.ch

SUPERVOLCANOES

Dangerous bubbles

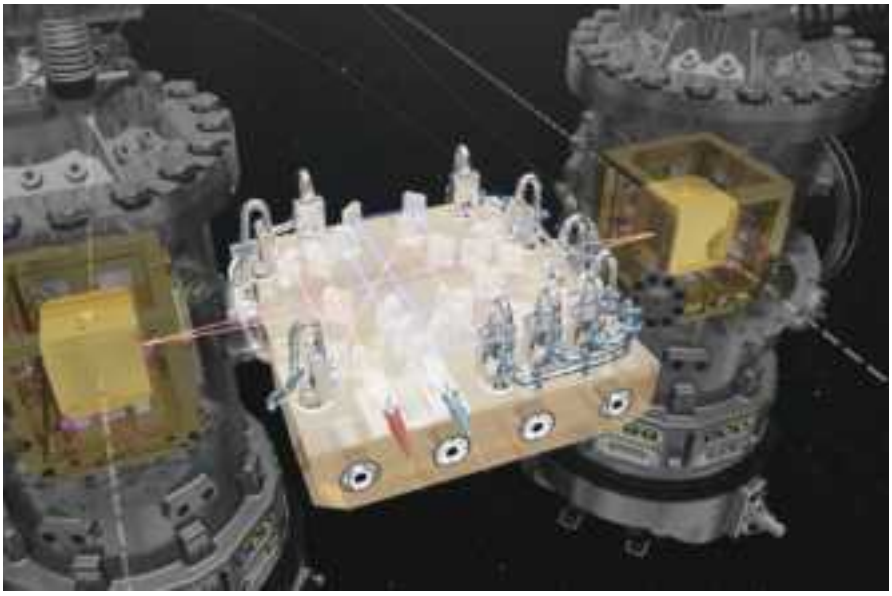
ETH researchers led by Professor Olivier Bachmann have been using a computer model to work out why supervolcanoes are so explosive. In their model, they allow gas bubbles to rise through different zones of a magma reservoir. In crystal-rich layers, finger-like bubbles snake upwards rapidly. But when they reach the viscous melt above, the fingers of gas separate into more spherical bubbles which slow each other down as they rise, and accumulate under the roof of the reservoir. This creates intense pressure, which can lead to an explosive event, such as the spectacular Mount Tambora eruption in 1815. ■

www.geopetro.ethz.ch

LISA PATHFINDER

Measuring technology works perfectly

The LISA Pathfinder mission was a success: control and measuring instruments developed by ETH researchers proved they were up to the job. The much larger LISA experiment can now go ahead as planned.



The measuring system with free-floating test masses (golden cubes) worked perfectly after only a short time.

The European Space Agency (ESA) launched a rocket from Kourou, French Guyana, in December 2015. On board was a LISA Pathfinder satellite carrying sophisticated measuring and control instruments. This project paves the way for a space observatory designed to measure gravitational waves. Key components of the measuring technology are two free-floating cubes made of a gold-platinum alloy which barely move in relation to one another.

After only two months of operation, the scientists announced the first results in June 2016. The measuring system is able to detect minute changes in distance between the cubes down to a few pico-metres. The test masses accelerated relative to one another by an unimaginably tiny amount – a trillionth of the earth's gravitational acceleration. The measuring system therefore far exceeded the requirements.

ETH professor Domenico Giardini and his team played an important part in the project's success. Working with the Swiss company Ruag Space, they developed the measuring system and control electronics which keep the LISA Pathfinder satellite in a highly stable orbit. ETH Zurich's control electronics also ensured that the cubes floated freely in the satellite.

The technology tested with the LISA Pathfinder satellite will now be further developed and employed in a much larger mission: LISA (laser interferometer space antenna) is an ESA space observatory designed to measure gravitational waves in space. As part of that mission, ESA plans to send three satellites into space in the year 2034, positioning them in a triangular formation. Each satellite will carry two cubes like the ones just described. The satellites will be connected to one another by laser beams. On the LISA Pathfinder, the distance between the cubes was only 48 centimetres, but on LISA it could be as much as 5 million kilometres. ■

www.geophysics.ethz.ch
sci.esa.int/lisa-pathfinder

USING WOOD RESOURCES

Chemicals from wood waste

Medicines, solvents, polymers – in future, it will be possible to manufacture many of these from wood waste. What's more, the processes will be as cost-effective, environmentally friendly and safe as current oil-based processes.

Many chemicals are produced from oil. Since oil reserves are finite, scientists have been looking for ways to manufacture these products from sustainable materials. Suitable source materials include wood or cellulose waste from the forestry and paper industries. This was demonstrated in a comprehensive lifecycle assessment carried out by an ETH team led by Professor Konrad Hungerbühler.

The researchers found that succinic acid – a base chemical with many industrial applications – can be manufactured in a cost-effective, non-polluting and safe way from this type of biomass waste with the help of bacteria. Succinic acid is used to manufacture vitamins, medicines, solvents, crop protection agents, polymers and fragrances for perfumes.

The European paper industry could regain ground from strong overseas competition.

The wood industry generates waste which can be put to good use in future.

The scientists used simulations to compare different biotechnological methods of producing succinic acid with traditional oil-based methods. They concluded that production using wood or cellulose waste is 20 percent cheaper for the same environmental impact, or that environmental impact can be reduced by 28 percent for a similar cost.

The paper industry generates alkaline waste solutions containing cellulose, which are not currently recycled. The scientists believe that using them as input materials for the chemical industry could make the European paper industry more competitive. ■

www.setg.ethz.ch

CATALYSIS RESEARCH

Using methane rather than flaring it

Methane is a cheap and plentiful gas which could be used as a fuel and as a base material for the chemical industry. However, huge quantities of it are simply burnt off around the world – especially at oil fields and refineries. One reason for this wasteful approach is that it is currently expensive and thus not commercially viable to convert the gas into liquid methanol, which is easier to transport.

Professor Jeroen van Bokhoven and his ETH team have demonstrated a new way of converting methane directly and easily into methanol using a zeolite catalyst. Unlike existing methods, which involve a two-stage cyclical process whereby the temperature is increased to 450°C and then reduced to below 200°C, the new reaction runs at a steady 200°C. The scientists achieved this through an ingenious trick: they increased the pressure of the methane to 36 bar, instead of less than 1 bar as in the conventional process.

The new process is not yet suitable for industrial application, as it only yields small amounts. However, the scientists believe that yields can be increased using new catalysts optimised for high-pressure reactions. ■

www.chab.ethz.ch/icb

QUANTUM PHYSICS

Setting a record for oscillating quantum states

ETH researchers led by Professor Jonathan Home have set a record for oscillating quantum states of single charged atoms. The experiment can be visualised as a marble at the bottom of a salad bowl. The marble can be made to oscillate back and forth in the bowl by shaking the bowl to and fro quickly enough.

The ETH researchers did something similar with an ion trapped in an electric field: by suddenly applying an additional electric field, they made the ion oscillate violently. As a result, the ion effectively jumped 10,000 rungs up the ladder of quantum levels. Up to now, scientists have only managed to generate oscillatory states corresponding to about a hundred rungs.

One major challenge was to switch the electrical fields quickly enough, at intervals of a few billionths of a second. The new technique could be used to speed up quantum computers. The transport of ions currently represents a bottleneck in the overall speed of quantum computers. The new method could make them move faster. ■

www.iqe.phys.ethz.ch

MICRO-TECHNOLOGY

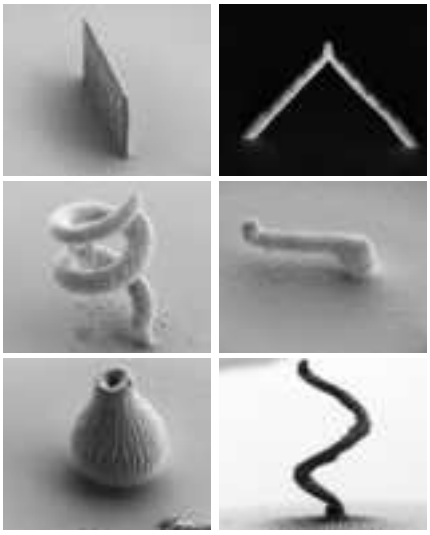
Printing tiny objects and extracting cell contents

The world's smallest syringe, developed at ETH Zurich, can be used to print microscopic objects by 3D method or to extract the content of biological cells.

In the past few years, ETH scientists have developed a micro-injection system which can be described as the smallest syringe in the world. The system is called FluidFM. At the heart of this system is a moveable micropipette mounted on a leaf spring, which can be positioned with extreme precision. ETH researchers have now developed the system further, firstly to design a new micro-3D printing technique, and secondly to create a process for analysing individual biological cells.

The new micro-3D printing application makes it possible to produce tiny, complex metal structures easily and in a single step.

The development of the micro-injection system paves the way to highly promising applications in micro-3D printing technology and biomedical research.



These structures printed with FluidFM are only 15–30 micrometres wide.

The researchers can move the micropipette print head by computer and use it, for example, to electro-deposit dissolved metals onto a substrate. This allows them to print three-dimensional objects. As the print head can also print sideways, overhanging structures are possible.

Spectacular micro-objects made from copper have been created as part of a feasibility study. One particularly impressive object consists of three nested microspirals, which ETH researchers manufactured without using a template. Commercial applications could include the production of complex watch components or microtools.

Another new application of FluidFM lies in biomedical research. So far, scientists have been able to inject substances into cells with micro-needles or pick up and move individual cells via a vacuum. ETH researchers working with Professor Julia Vorholt have now developed the system so that they can also extract the content of cells for analysis. This application is helpful for biologists who want to study the behaviour of individual cells, rather than an entire cell population. ■

www.biomed.ee.ethz.ch

NANO PRINTING PROCESSES

More transparent, more efficient touchscreens

Every touchscreen needs transparent electrodes to allow the device to recognise when and where a finger touches the surface. ETH researchers led by Professor Dimos Poulikakos have created a new kind of transparent electrode using a 3D printing process. This comprises a grid of gold or silver "nanowalls" on a glass surface. The walls are so thin that they can hardly be seen with the naked eye. It is the first time that scientists have been able to produce such nanowalls with 3D printing.

The new electrodes are more conductive and more transparent than those made of indium tin oxide, the material used in smartphones and tablets today. This is a clear advantage – the more transparent the electrodes, the better the screen quality. The more conductive they are, the more quickly and accurately the touchscreen will work. Possible future applications also include solar cells, which likewise require transparent electrodes.

The next big challenge will be to upscale the method and develop the print process further so that it can be implemented on an industrial scale. It will hopefully be more cost-efficient, as the new process, unlike that for producing indium tin oxide electrodes, does not require a cleanroom environment. ■

www.ltnt.ethz.ch

3D PRINTING

Printable robots

It sounds like every child's dream: in minutes you can design a robot on your computer screen, print the parts on a 3D printer, assemble them and start playing. Computer scientists at Disney Research in Zurich have made this a reality. They have developed software that allows even novice users to design custom robots and their movements on a PC. The programme offers tools similar to those used in the animation of purely digital figures, whilst obeying the laws of physics. The programme automatically generates three-dimensional assembly plans for all segments of the body and for the connecting parts, which house the electric motors. These can then be printed on a 3D printer. ■

www.disneyresearch.com

BATTERY RESEARCH

Solid batteries improve safety

Lithium-ion batteries store a lot of energy in a small space, making them the ideal energy source for mobile electronic devices such as phones and laptops, as well as e-bikes and electric cars. But lithium-ion batteries are not without their dangers: there have been past reports of some catching fire or exploding, resulting in serious injuries and major fires. Researchers at ETH Zurich have now developed an innovative type of battery that consists entirely of solid chemical compounds and is non-flammable.

In conventional lithium-ion batteries, the positive and negative poles are made of solid conductive compounds; charges move between these electrodes in a liquid or gel electrolyte. If this type of battery is not charged correctly or is left lying in the sun, the liquid can ignite. This is not the case with solid-state batteries: here, the electrolyte is made of solid material, so the battery is non-flammable.

ETH researchers led by Professor Jennifer Rupp have produced a sandwich-like battery featuring a layer of lithium-bearing compound (lithium garnet), which acts as a solid electrolyte. This makes it possible to operate batteries at higher temperatures and also produce thin-film batteries for use in portable electronic devices.

Solid-state battery with a white lithium garnet layer between two electrodes.

One of the challenges was to connect the electrodes and electrolyte in such a way that the charges can circulate between them with minimal resistance. ETH researchers increased the contact area between the negative pole and the solid electrolyte by creating an electrolyte layer with a porous surface and applying the material of the negative pole onto it. This allows the battery to be charged faster. ■

www.electrochem.mat.ethz.ch

VIBRATION INSULATION

Lattice structure absorbs vibrations

An ETH research team led by Professor Chiara Daraio has developed a rigid lattice structure capable of absorbing vibrations. Vibrations in vehicles, machines and household appliances are usually absorbed using soft materials.

The new structure can absorb a much wider range of vibrations compared with existing absorption materials, and is particularly good at absorbing slow vibrations. This includes audible vibrations which cause noise pollution and reduce the energy efficiency of machines and vehicles. The rigid structure can also be used as a load-bearing component, for instance in mechanical engineering applications, helicopter and wind turbine rotors, aircraft propellers and rockets.

The scientists made the structure, which has a lattice spacing of 3.5mm, out of plastic using a 3D printer. Inside the lattice, they embedded steel cubes that are slightly smaller than dice and act as resonators. Instead of the vibrations propagating from one end through the entire structure, they are absorbed by the steel cubes and the plastic grid rods, so that the other end of the structure does not move. ■

www.mechmat.ethz.ch

MATERIAL SCIENCES

High-efficiency filters

ETH researchers working with Professor Raffaele Mezzenga have developed a new filtration system that efficiently removes toxic heavy metals and radioactive substances from water. At the heart of the filtration system is a new type of hybrid membrane made up of activated charcoal and tough, rigid whey protein fibres. These components are cheap to obtain and simple to produce. First of all, the whey proteins are denatured, which causes them to stretch and congregate into amyloid fibrils. They are then applied, together with activated charcoal, to a suitable substrate material, such as cellulose filter paper. The carbon content is 98 percent, and the protein content only 2 percent. This hybrid membrane absorbs various heavy metals, such as lead, mercury, gold and palladium, in a non-specific manner. It also absorbs radioactive substances, such as uranium or phosphorus-32. Moreover, the membrane eliminates highly toxic metal cyanides from water, including gold cyanide, which is commonly used in the electronics industry to produce conductor tracks on circuit boards. It is then a simple matter to recover the valuable precious metal. The filtration process is extremely straightforward: contaminated water is drawn through the membrane by vacuum. The vacuum can be generated with a simple hand pump, enabling the filtration system to be operated without electricity. Furthermore, the system is almost infinitely scalable, allowing even large volumes of water to be filtered cost-effectively. ■

www.fsm.ethz.ch

DRIVE SYSTEMS

Ultra-fast magnetic drive

In collaboration with the ETH spin-off Celeroton, researchers at the Power Electronic Systems Laboratory (PES) have developed a new kind of magnetically levitated reaction wheel motor that reaches speeds of more than 150,000 revolutions per minute. This is several times faster than comparable previous models. Amongst other things, reaction wheels are used in satellites to change their attitude. As soon as the flywheel rotates in a certain direction, a torque is transmitted to the satellite. The satellite then rotates in the opposite direction, producing a different orientation.

The high rotational speed of the drive system has allowed the researchers to make it much smaller, since it delivers the same angular momentum as a large motor, despite the smaller dimensions. This makes it attractive for use in small satellites about the size of a shoebox. Magnetic support has also allowed the researchers to avoid vibrations acting on the satellite. As the system does not require lubrication, it can be operated in a vacuum, which makes it perfect for use in space. Magnetic support also enables the reaction wheel to rotate gently and smoothly, as there is no frictional resistance when the system starts to move. The system developed by the researchers is, however, more complex than previous reaction wheel drives. Sophisticated power electronics are needed to steer and control it.

Previous electrically driven reaction wheels are connected to an electric motor via a pin and mounted on ball bearings. However, these drives have a number of disadvantages that the new system addresses. ■

www.pes.ee.ethz.ch

Magnetic support makes it possible to avoid vibrations acting on the satellite.

EPIGENETICS

Reversing traumas

A research team led by Isabelle Mansuy, Professor at ETH Zurich and the University of Zurich, have shown for the first time that a stimulating, stress-free environment allows trauma-related, inheritable symptoms in mice, such as behavioural changes, to be reversed. At the molecular level, these behavioural alterations are associated with an increased number of glucocorticoid receptors in the hippocampus – a brain area essential for cognitive processes. This receptor reduces stress responses by binding stress hormones such as cortisone. Traumatic experiences cause epigenetic changes to the gene for this receptor. They lead to an increase in gene activity and increased production of the glucocorticoid receptor. The epigenetic alterations affect not only cells of the hippocampus but also the sperm. The scientists therefore believe that the epigenetic patterns of male mice are inherited by their offspring. A stimulating, stress-free environment can correct the epigenetic effects of early childhood trauma. This correction is also passed onto the offspring. ■

www.ethz.ch/neuroepigenetics

OPTICAL COMMUNICATION

Switching with atoms

Researchers led by Juerg Leuthold, Professor of Photonics and Communications, have created the world's smallest optical switch. It operates by moving individual atoms.

Modulators convert information originally available in electrical form into optical signals. They are fast electrical switches and are installed in data centres in their thousands. Modulators currently require a lot of space and electricity. That is not the case with the new switch developed by an ETH working group under Professor Juerg Leuthold. It is the smallest optical modulator in the world – even smaller than the wavelength of light used in the system. The modulator consists of two tiny pads, one made of silver and the other of platinum. These sit on top of an optical waveguide made of silicon. The two pads are arranged alongside each other just a few nanometres apart, with a small bulge on the silver pad protruding into the gap and almost touching the platinum pad.

Light from an optical fibre guided to the entrance of the gap by the optical waveguide is turned into a plasmon. Plasmons occur when light transfers energy to electrons in the outermost atomic layer of the metal surface, causing the electrons to oscillate. Because they have a smaller diameter than light rays, they can pass through the gap. On the other side of the gap, the electron oscillations are converted back into optical signals. If a voltage is now applied to the silver pad, a single silver atom moves towards the tip of the point. This creates a short circuit between the pads, so that electrical current flows between them. This closes the loophole for the plasmon and the switch turns to "Off". As soon as the voltage falls below a certain threshold again, a silver atom moves back. The gap opens, the plasmon flows, and the switch goes "On". This process can be repeated millions of times. The modulator is not yet ready for mass production. ■

www.ief.ee.ethz.ch

A silver and a platinum pad lying on an optical waveguide (blue strip).

FIELD PHENOTYPING PLATFORM

Eye in the sky to monitor crops

On 10 June 2016, ETH scientists led by Professor Achim Walter launched a field phenotyping platform (FIP) – a new, large-scale system for researching crop plants at the Research Station for Plant Sciences in Lindau-Eschikon.

The FIP is the first system of its kind in the world. It is helping researchers to take a major step towards "Agriculture 4.0", in which computers and sensor-based data become indispensable tools for farmers, breeders and agricultural researchers. Phenotyping – using digital technologies to collect data on the external appearance and metabolic functions of plants – is a key part of digital agriculture.

The FIP allows the scientists to analyse crop plants in minute detail all year round: to discover, for instance, how individual varieties differ from one another, or how their development depends on temperature or soil moisture. The researchers are currently analysing hundreds of small plots of different varieties of wheat, soy, maize, buckwheat and forage grasses. They are also able to detect whether and how fungal diseases are developing, or how much weed growth there is. According to the scientists, in future the experienced eye of the farmer or grower will be supported by a range of sensors capable of identifying diseases and providing information on the potential use of crop agents, for example. The FIP is based on the same principle as "spider cams": four masts, each one 24 metres high, are positioned at the four corners of a trial plot. Double-braided cables run from their summits to a sensor head which hovers above the ground and can be positioned using cable winches. The sensor head is equipped with a laser measuring device, multispectral cameras, an infrared camera and two spectrometers. ■

In ten years' time, the experienced eye of the farmer will be supported by a range of sensors.

www.kp.ethz.ch/infrastructure/FIP

The sensor head is the heart of the phenotyping platform.

BIOTECHNOLOGY

Beta cells from "spare tyres"

ETH researchers led by Professor Martin Fussenegger have achieved a remarkable feat. They have extracted stem cells from a 50-year-old person's fatty tissue and used genetic reprogramming to make them mature into functional beta cells. In the presence of glucose, the beta cells generated using this "genetic software" produce the hormone insulin – just like the natural beta cells found in the pancreas. The technique developed by the ETH researchers might make it possible to implant new beta cells in diabetes patients that are made from their own adipose tissue. Since the cells are made from material taken from the patient's own body, there would be no complications with the patient's immune system. ■

www.ethz.ch/betacells

IMAGING TECHNIQUES

Visualising muscle disease

Amyotrophic lateral sclerosis (ALS) is an incurable muscle disease in which the nerve cells responsible for muscle control progressively degenerate. It causes muscular atrophy and paralysis, leading to difficulties with walking, speaking and swallowing. At best, drugs can delay the progression of the disease, but often life expectancy is only a few years after the initial diagnosis. Very little is known about the causes of the disease. A new marker substance developed by ETH researchers working with Professor Simon Ametamey could make a vital contribution to ALS research.

The new substance could make it possible to monitor the progression of ALS in patients using positron emission tomography (PET). PET is an imaging technique that makes specific molecules on the cell surface visible within the body tissue. The method uses marker substances which adhere to the molecules. They are weakly radioactive and the radiation is measured during the PET scan. The new marker substance has already been successfully tested on rats and mice with inflamed nerve tissue, and ETH scientists have filed a patent for the molecule. The next step will be to perform clinical trials in humans. ■

www.chab.ethz.ch/ipw-en

“I think it’s important to know about the latest **industry trends** and to understand the **role** played by ETH **research**.”

Christa Bodmer, Bachelor’s student, Health Sciences and Technology

Industry and society

ETH Zurich is committed to making its knowledge available to industry and society. Spin-off companies founded by ETH researchers play an important role in this process. 2016 was another successful year in this respect, with 25 spin-offs founded at ETH Zurich – equalling last year's record.

Our University also maintains good relations with established companies. These contacts were among the reasons why the European Space Agency (ESA) awarded ETH Zurich a contract to set up a Business Incubation Centre in Switzerland. This provides us with another attractive platform for developing innovative technologies and start-ups.

The University took the opportunity to engage with the public at a number of events. At the opening of the Gotthard Base Tunnel, for example, it demonstrated how ETH engineers have contributed to the success of this monumental project. And at the Cybathlon organised by ETH, the audience could learn how the latest assistive technologies can help people with disabilities in their everyday lives.

ETH technologies in daily use

10.30 a.m.
Indoor navigation with sensors
www.sensirion.com

9 a.m.
Parcel delivery by drone
www.wingtra.com

7.30 a.m.
App to look for parking spaces
www.parquery.com

6 a.m.
Tailor-made jeans ordered online
www.selfnation.ch

12 noon
Melt-in-the-mouth chocolate
www.ethz.ch/windhab

1.30 p.m.
Painless medical treatments
www.zurimed.com

3 p.m.
Real-time game analysis
www.vizrt.com

4.30 p.m.
Lighting to ward off intruders
www.comfylight.com

KNOWLEDGE AND TECHNOLOGY TRANSFER

Spin-off record equalled

There were 25 spin-offs founded at ETH Zurich in 2016, equalling the record number from the previous year. From wood to robots – these new start-ups also reflect the University's broad range of research topics.

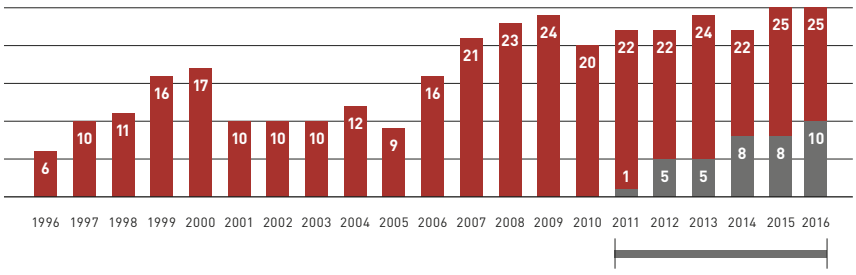
ETH Zurich can look back on another successful year of spin-offs: a total of 25 new businesses were established in 2016, matching the 2015 record. This marks the 10th year in a row that over 20 spin-offs have been founded at ETH in a single year – a unique achievement in Swiss higher education. Ten of the newly founded ETH spin-offs were created through the Pioneer Fellowship programme. For Detlef Günther, Vice President Research and Corporate Relations, the consistently high number goes to show that ETH Zurich is following the right path in nurturing students from an early stage. A university's greatest achievement is helping young people to put their ideas into practice. ETH has students who, as Pioneer Fellows in 2016, founded companies while working toward their Master's degrees. This takes conviction, commitment and courage, as the path to success can be a long one, according to Günther.

For the 10th time in succession, over 20 spin-offs have been founded at ETH in a single year – a unique achievement in Swiss higher education.

The topical focus of the 25 new spin-offs reflects the entire range of research at ETH Zurich. The field of information and communications technology (ICT) is again well represented, with eight new start-ups. There was also a welcome increase in the area of mechanical engineering, where six new spin-offs were founded – twice as many as in the previous year. Four spin-offs were established in biotechnology, matching the 2015 figure. Among the new spin-offs, two companies offer solutions and products in the field of timber engineering, while three robotics companies are about to launch drones and walking robots developed at ETH.

www.ethz.ch/spin-offs-en

ETH Zurich's 355 start-ups over the period 1996–2016



Pioneer Fellows have founded a total of 37 spin-offs since 2011

SPARK AWARD

Radiation-free breast cancer screening

ETH Vice President Detlef Günther with winners Orçun Göksel and Sergio Sanabria.

In the future, breast cancer screening could be carried out using a radiation-free and painless ultrasound technique, rather than a mammogram. The new ultrasound examination method developed by ETH scientists Orçun Göksel and Sergio Sanabria convinced the Spark Award jury because of its potential for rapid acceptance and use in the medical market.

Four other ETH inventions reached the Spark Award finals: a method for early detection of lymphatic diseases, a flexible thermal flow sensor, a heavy-metal-free luminescent material and a 3D printer for metal. The Spark Award has been presented since 2012. The aim of the prize is to encourage scientists and researchers at ETH to start thinking at an early stage about how their research results can be put to practical use.

www.ethz.ch/spark-award-en

VENTURE 2016

A boost for IT and medical applications

Interest in the 11th Venture start-up competition was as strong as ever. The winner in the Business Idea category was theMOFcompany, a start-up from ETH Zurich, the Paul Scherrer Institute and the Zurich University of Applied Sciences.

Venture has its roots in an initiative launched by ETH Zurich, McKinsey and Knecht Holding in 1998. Since then, 2,700 teams have taken part and 5,500 jobs have been created for highly qualified individuals. Interest in the business plan and business ideas competition was as strong as ever in 2016. A total of 230 teams took part, with 114 submitting business ideas and 116 presenting business plans.

The top spot in the Business Idea category was taken by start-up theMOFcompany, a joint venture established by researchers at ETH Zurich, the Paul Scherrer Institute (PSI) and the Zurich University of Applied Sciences (ZHAW). The company is a market pioneer which plans to offer a unique production service for metal–organic frameworks (MOFs).

Second place in the Business Idea category also went to an ETH start-up. The fledgling company hemoTUNE has developed a revolutionary therapeutic platform for blood purification which uses functionalised magnetic nanoparticles.

While there was no ETH winner in the Business Plan category, two ETH representatives, ComfyLight and Peripal, made it into the top five. ComfyLight manufactures an intelligent LED light bulb that registers and analyses the behaviour of people at home. When they are not at home, the light bulb simulates their behaviour to ward off intruders. Peripal has developed a device that reduces the risk of infection among patients using home dialysis. ■

www.venture.ch

VENTURE KICK

A boost for IT and medical applications

A total of six young companies from ETH Zurich were among the winners in the last of the three rounds of the Venture Kick competition. These start-ups received 130,000 Swiss francs each in seed capital.

The six ETH spin-offs represent different disciplines: Aerotainment Labs offers flying drones, primarily for the events and entertainment segment. Xorlab, on the other hand, develops IT security solutions to fight cybercriminals. The jury were impressed by several developments for medical applications in 2016: HyloMorph has developed a membrane that protects implants against unwanted encapsulation by connective tissue. InterAx Biotech is developing new kinds of biosensors for the pharmaceutical industry that increase the speed and accuracy of testing to see how a particular drug affects a receptor. The fledgling company PharmaBiome is developing a revolutionary therapy to fight intestinal infections. Finally, Pregnolia is working on a special method to reduce the risk of premature births.

Venture Kick is an initiative to promote innovative business ideas, with the aim of increasing the number of spin-offs from Swiss universities. It is funded by foundations, companies and private individuals. ■

www.venturekick.ch

INNOVATION AND ENTREPRENEURSHIP LAB

Promoting young talent

The ETH Innovation and Entrepreneurship Lab (ieLab) was established at the end of 2012 with the aim of supporting young entrepreneurs and researchers, to help them make the results of scientific research carried out at ETH available to industry and society more quickly. Four years after the ieLab was founded, its new Head Tomas Brenner – who succeeded Peter Seitz in February – is very pleased with the progress to date. Thirty ETH start-ups have already been founded by Pioneer Fellows from the ieLab. Pioneer Fellows have taken part in over 100 business plan competitions so far, achieving first place on 50 occasions. They have secured funding totalling 3 million Swiss francs. The ieLab has also organised more than 150 seminars and runs intensive individual coaching sessions, workshops and other network events, giving talented young scientists the opportunity to engage with experienced entrepreneurs and experts from industry.

In 2016, the ieLab supported 26 Pioneer Fellowship projects and 12 ETH spin-offs. ■

www.ethz.ch/ielab

The ieLab brings together talented young scientists from ETH, entrepreneurs and industrial partners.

INVESTOR SUMMIT

New ideas to inspire

Seven promising start-ups and over 100 domestic and international investors attended the first Investor Summit at Zurich Airport, where innovative spin-offs from ETH had the opportunity to present themselves to potential investors and business partners. The start-ups were selected by a jury. Among other things, the companies had to demonstrate the potential to innovate and grow. The Investor Summit grew out of the DigitalZurich2025 initiative. Besides ETH Zurich, partners include the Swiss Economic Forum, Google, Zurich Airport, UBS and the *Neue Zürcher Zeitung* newspaper. ■

www.ethz.ch/investor-summit

Dominique Burger presented his start-up Archilogic at the first Investor Summit.

AUTOFORM

Majority acquisition

The Paris-based company Astorg Partners has acquired a majority stake in ETH spin-off AutoForm. Astorg is one of Europe's most successful independent private equity companies. It focuses on European growth-oriented technology companies. AutoForm was founded more than 20 years ago, making it one of ETH Zurich's earliest recognised start-ups. The company offers software solutions for sheet-metal forming in the automotive industry. AutoForm's customers include nearly all the major motor manufacturers. ■

www.autoform.com

OPEN SOURCE

New ways of transferring knowledge

There are many ways ETH knowledge finds its way into practice: via business start-ups, patents, collaboration with industry – or through open-source products. Two such products were a special talking point in 2016.

Lorenz Meier, a doctoral student in computer science at ETH Zurich, wrote the software that is now used to pilot many drones. In 2008, he started developing the first building blocks of his PX4 platform as a side project, in parallel with his Master's degree. In 2016, the company Qualcomm Technologies, one of the world's biggest electronics manufacturers and the market leader for drone processors, adopted this software as standard. Meier didn't achieve all this single-handed: the software came into being thanks to a worldwide team of developers working under the ETH doctoral student's leadership. It was made possible by the fact that PX4's source code is open-source – in other words, it is freely available to all interested parties. Any drone manufacturer can use the code free of charge and tailor it to its own needs. In addition, any user can expand PX4 with their own software to add special functions. This modularity is one of the main reasons why companies such as Qualcomm put their faith in PX4. In addition, scientists at ETH and other renowned universities, such as MIT and Stanford, use PX4 for their research drones.

Open-source hardware

In future, it will be easier and cheaper for developers at universities and small and medium-sized enterprises (SMEs) to build wearable microelectronic devices and chips for the internet of things, thanks to an open-source processor which has been developed at ETH Zurich and the University of Bologna. This processor now makes it possible to build open source hardware from the ground up. The new processor is called PULPino and is designed for battery-powered devices with extremely low energy consumption (PULP stands for "parallel ultra-low power"). These could be chips used in small devices, such as smartwatches, sensors for monitoring physiological functions (which can communicate with a heart-rate monitor, for instance) or sensors for the internet of things. The researchers are currently using the PULPino processor to develop a smartwatch with electronic features and a micro camera. It can analyse visual information to determine the user's location. The idea is that a smartwatch like this could one day control devices in the home, for example. But PULPino should also benefit SMEs of the kind typically found in Switzerland and Europe. Developing processors is still an expensive business. Using the royalty-free, open-source chip reduces development costs significantly, which will be of great help to SMEs. ■

www.ethz.ch/droneflight-control
www.ethz.ch/open-source-processor

WORLD WEB FORUM

Inspiring young people

During the fourth World Web Forum, the world-famous digital conference, ETH Zurich hosted a fringe event with distinguished speakers such as John Sculley, the former CEO of Apple and Pepsi. The event was organised by the Department of Computer Science, with free admision for students, trainees, and young entrepreneurs. Held in partnership with the canton of Zurich, eZürich, and the ETH Entrepreneur Club, it provided an opportunity for attendees to hear prominent speakers and leaders from the digital sector and become inspired to develop their own IT start-ups. ■

www.ethz.ch/world-web-forum

The three chosen start-ups aim to use technology developed in space research for terrestrial applications.

ETH Zurich can offer a new platform for innovative technologies and start-ups, and link up with other ESA locations across Europe.

ESA BIC SWITZERLAND

ETH wins competition for start-up programme

The Swiss Business Incubation Centre of the European Space Agency promotes start-ups relating to space technologies. The top three start-ups were selected by a jury.

In September, the European Space Agency (ESA) awarded ETH Zurich a contract to establish a Business Incubation Centre in Switzerland (ESA BIC Switzerland). ETH Zurich succeeded not least because of its many domestic and international industry contacts. ETH has secured more than 50 industry and research partners, who will be vitally important for ESA BIC Switzerland. The decision was also influenced by ETH Zurich's excellence in relevant technological areas – such as autonomous systems, drones and the internet of things – that already make use of ESA technology and data. This will allow ETH Zurich to offer a new platform for innovative technologies and start-ups, and link up with other ESA locations across Europe.

A highly attractive programme

The focus of the ESA BIC Switzerland is on Swiss start-ups that transfer innovations in space technology to other applications. With funding of up to 500,000 euros per start-up, as well as technological and business support, the ESA BIC Switzerland is a highly attractive programme for young entrepreneurs. The companies also benefit from individual coaching, networking activities and a Europe-wide network of industry and research contacts. It is initially set up for five years and supports up to ten start-ups per year.

The first three start-ups – Twingtec, Insolight and Ligentec – were selected by a jury made up of representatives from the ESA, ETH Zurich and other involved partners. A mobile wind generator that produces electricity cheaply, solar cells that are twice as efficient as conventional products, and frequency combs that increase the data capacity of fibre-optic cables by a factor of 200 are among the technologies the winners are developing. The supported start-ups will be based at the Switzerland Innovation Park Zurich in Dübendorf.

As well as ETH Zurich, the consortium behind the ESA BIC Switzerland includes the Institut für Jungunternehmen (IFJ) and the start-up initiative Venture Kick. Fifty other well-known national and international partners from industry and research are also involved in the ESA BIC Switzerland. ■

www.esabic.ch

INDUSTRY DAY

Industry meets science

Industry and business representatives met with researchers from ETH Zurich for the fourth year running. One of the key topics was food and nutrition. Visitors were also given an insight into research activities in the fields of data science, energy and resources, entrepreneurship and materials science. With a record 550 participants in 2016, the event has continually attracted increasing numbers visitors eager to meet the scientists. ■

www.ethz.ch/industry-day-en

For a fourth year, Industry Day met with lively interest.

ETH BIBLIOTHEK

Open access and crowdsourcing

For many years, the University's central library, ETH Bibliothek, has helped ETH members along the road to open access publishing, whereby scientific texts are first published in an open access medium. The extent to which research results should be made freely available is a question being asked more and more, and not only in Switzerland. The swissuniversities organisation, together with the Swiss National Science Foundation, was therefore tasked with launching a national strategy. The ETH Bibliothek is also involved in developing the strategy.

In the area of crowdsourcing, the ETH Bibliothek has established itself as a pioneer among libraries, archives and museums across Europe. The image archive leverages the knowledge of volunteers to catalogue photographs. It has been amazingly successful: several thousand images were identified over the course of the year, thanks to the specialised knowledge of many users. ■

www.library.ethz.ch

ATLAS OF SWITZERLAND

Now available online

The first *Atlas of Switzerland* was commissioned by the Swiss Federal Council and appeared in 1961. Over the next 40 years it depicted the geographical diversity of Switzerland using 600 printed thematic maps. In the year 2000, the atlas was offered on CD-ROM for the first time. Expanded and updated editions followed in 2004 and 2010, available on CD or DVD. The makers of the atlas have now taken things a stage further: as of mid-2016, the *Atlas of Switzerland* is available online and free of charge. The data do not have to be downloaded to the user's computer – instead they can be accessed using a handy app.

The *Atlas of Switzerland* – online was developed at ETH Zurich's Institute of Cartography and Geoinformation in partnership with the Swiss Federal Offices of Topography, Statistics and the Environment, plus some 70 other institutions. The true scientific achievement of this map series lies in the careful checking, analysis and editing of data from a very wide range of sources.

The cartographers used a virtual 3D globe as the basis for the atlas. This allows users to navigate the maps using functions such as continuous zooming and panning, and also to move around freely within the virtual space. Besides a well-established collection of map topics, the online atlas now also offers a History and Future category, showing changes in the population distribution of Switzerland over time, for example. ■

www.atlasderschweiz.ch/en

GOTTHARD BASE TUNNEL

Finished at last

After decades of work, the new Gotthard Base Tunnel was opened on 4–5 June with a big public celebration. ETH Zurich was there too, and with good reason: ETH engineers and researchers have been vital contributors to the success of this project.

The new 57 km long Gotthard Base Tunnel is a truly monumental feat of civil engineering, and ETH played an important role in its success. On the one hand, many of the scientists and engineers involved in the project once studied at ETH. On the other hand, many research findings of ETH scientists were put to direct practical use in its execution. For example, ETH geologists came up with technical solutions for addressing problems in two key areas of the tunnel structure: the Piora syncline on the southern side of the Gotthard and the Tavetsch intermediate massif in the northeast. Their calculations helped avoid costly construction delays. Researchers at the Institute of Geodesy and Photogrammetry also made important contributions to the successful completion of the tunnel. The tunnel surveying specialists provided the scientific basis for the planning and engineering of the new link.

Given these important contributions, ETH had every right to feel proud as it presented its achievements to an audience during the opening ceremony. But the University is also looking ahead: the many visitors to the ETH exhibition were able to inspect various experiments and exhibits that ETH researchers and students presented at seven stands addressing the theme "The mobility of the future". ■

www.gottardo2016.ch/en

The ETH exhibition was an eye-opener for visitors.

SWISS SEISMOLOGICAL SERVICE

Keeping the public informed about earthquakes

After ten years of intensive research, the Swiss Seismological Service (SED) has created an updated seismic hazard model, which confirms that earthquakes are a serious hazard for Switzerland.

The Swiss Seismological Service (SED) at ETH Zurich is the official federal agency for earthquake monitoring. When the ground shakes perceptibly, its website is the first place many people look to get information. That much is clear from the number of users. For example, over 6,000 people visited the SED website in the first five minutes after the 4.2 magnitude earthquake which occurred in Leukerbad, Switzerland, on 25 October 2016. But even in calm periods, there is a considerable appetite for information about earthquakes, given that the website receives over 45,000 visits per month.

This places heavy demands on the service in terms of the preparation and analysis of seismic data, as well as their publication and interpretation. Moreover, the need for information is growing, not least among mobile users. To meet user needs more effectively in the future, the SED took the opportunity presented by the changeover to a new system to bring its website up to date. As of November 2016, the SED website can now be accessed from mobile devices as well as desktop computers. The content has also been updated, expanded and comprehensively translated into four languages, and the different earthquake maps can be explored interactively. ■

www.seismo.ethz.ch/en

The Piz Daint supercomputer now has around 20 petaflops of computing power.

CSCS

More computing power for Piz Daint

Right on time for the 25th anniversary of the CSCS, the flagship supercomputer Piz Daint has had its computing power tripled. This helps safeguard the international competitiveness of computer-aided research in Switzerland.

The ETH-affiliated Swiss National Supercomputer Centre (CSCS) celebrated its 25th anniversary in October. At the same time, the flagship supercomputer Piz Daint was given an upgrade. For the last three years, it has been Europe's most powerful supercomputer, with a peak performance in excess of seven petaflops. The new hardware means it will stay that way – at least for the time being. Since December 2016, Piz Daint has had a peak performance of around 20 petaflops. This is important both for high-resolution simulations and for the field of data science, which requires the analysis of enormous volumes of data, and which ETH Zurich is establishing as a research priority. Today, materials science, geophysics, life sciences and climate sciences all use highly data-intensive and CPU-intensive simulations. The new hardware allows researchers to carry out these simulations more realistically and more efficiently. In the future, Piz Daint will also provide data-analysis support for major scientific experiments that are already under way, such as the Large Hadron Collider at Cern.

As part of the upgrade, the graphics processors and conventional processors of the computer nodes were updated. New Data-Warp technology was also installed. This quadruples the effective bandwidth for long-term storage; in other words, data is transferred in and out of storage far more quickly, making it possible to analyse millions of small, unstructured files. This enables Piz Daint to transfer initial results to a specialised area of the supercomputer for analysis while calculations are still ongoing. Even with the new hardware, Piz Daint remains an energy-efficient, balanced system capable of performing a wide range of complex simulations and data analyses. ■

www.cscs.ch

COLLEGIUM HELVETICUM

A new Director and a new partner

The Collegium Helveticum, the laboratory for transdisciplinary research at ETH Zurich and the University of Zurich, has a new Director: Thomas Hengartner, Professor of Ethnology at the University of Zurich, took over from ETH Professor Gerd Folkers at the beginning of 2016. The think tank, whose central purpose and vision is to promote knowledge exchange between the natural sciences, the humanities, art, technology and medicine, also has a new partner: Zurich University of the Arts became an affiliate of the Collegium in the middle of the year. It also provided one of the seven new fellows elected in the summer for the period 2016–2020. Over the coming years they will focus on the theme of digital societies. ■

www.collegium.ethz.ch/en

ETH students bolted the pavilion together in an assembly hall.

MANIFESTA 11

Pulling in the crowds at Bellevue

Last summer, Zurich hosted a major contemporary art event: over 170,000 people visited Manifesta 11, the European Biennial of Contemporary Art. ETH Zurich also took part in this cultural event with three projects.

Undoubtedly the biggest attraction of Manifesta 11 was the Pavilion of Reflections at Bellevue. This impressive timber construction created by ETH Zurich was a very imposing feature – indeed, it was the focal point of the Biennial.

The floating structure, reminiscent of a Mediterranean village square, was built by 30 architecture students from ETH Zurich's Studio Tom Emerson during ten months of intensive work. The pavilion was a remarkably complex project for the studio. With a 600m² footprint, the pavilion could accommodate up to 300 visitors. As well as complying with strict fire safety regulations, the builders had to meet the challenging specifications of the Manifesta organisers: the platform had to have an outdoor swimming pool, toilet facilities, a spectator stand and a large screen for showing films. The task of assembling the prefabricated elements on the Mythenquai and hauling the pavilion by barge across the lake to Bellevue were among the logistical challenges that had to be overcome.

A group led by Professor Alexander Lehnerer also took part in the Manifesta. They transformed the Cabaret Voltaire into a Guildhall of the Arts during the Biennial, to which only people involved in artistic activities were admitted. ETH doctoral student Mathias Bürki collaborated with the French artist Marguerite Humeau on a performance event, previously shown at ETH, which explored the question of whether robots can experience love. ■

m11.manifesta.org

ETH MEETS CALIFORNIA

A visit to the West Coast

ETH Zurich maintains a close network of contacts worldwide, with California a strategically important region in this respect. To continue developing its relations with that part of the US, the University and other partners organised a series of ETH Meets California events in April at different locations. The researchers from Zurich talked about the questions they are researching jointly with US partners. A wide range of issues was discussed in a variety of formats, ranging from black holes to earthquakes, drones and film animations to the cities of the future. ■

www.ethz.ch/california

THE VENICE ARCHITECTURE BIENNALE

Sustainable cities

"Reporting from the front" was the theme of the 2016 Venice Architecture Biennale held from late May to late November. At the invitation of curator Alejandro Aravena, several project groups in which ETH was involved contributed to the main exhibition, exhibited in national pavilions and played an active role in the supporting programme.

The exhibition set out to address how architecture can improve people's lives, so it was not surprising that ETH Zurich had such a high profile. For several years, the development of sustainable cities has been a focus of the University's research, tackling problems that urban regions face, such as rapid population growth, human migration and climate change – challenges requiring new solutions.

In Venice, ETH researchers showed, for example, how an elegant vault structure can be built from unreinforced limestone using digital planning and fabrication methods, how sustainable buildings can be produced with clay and earth, and how Brazilian favelas and informal settlements in Cairo differ from formally created cities. But the ETH architects also focused on certain fundamental aspects. For example, one presented a project looking at how the representation of architecture can change architecture itself. Another delved into the question of how raw material and energy reserves can be saved using decentralised, renewable production strategies. ■

www.labiennale.org

TREFFPUNKT SCIENCE CITY

Healthcare and the digital revolution

The Imperfect Human and Life In The World 4.0 were two of the topics addressed by the popular event series Treffpunkt Science City in 2016. Over 20,000 visitors were inspired by lectures, demonstrations, exhibitions, laboratory visits and panel discussions from the exciting world of research, and discovered firsthand what socially relevant topics ETH researchers are currently working on.

The spring series was devoted to the subject of healthcare. Visitors learned, for example, how modern assistive technologies are helping people with physical disabilities in their everyday lives, how new therapeutic approaches are making personalised medicine a reality, or how people can remain fit and healthy for as long as possible, both physically and mentally.

The autumn series was concerned with the digital revolution, which is having a growing influence on our everyday lives. ETH researchers explained how smart objects work, how robots could affect our daily lives, and how the digital revolution affects our social behaviour. ■

www.treffpunkt.ethz.ch

Treffpunkt Science City makes learning enjoyable for young and old.

CYBATHLON

A successful world premiere

The world's first Cybathlon was held on 8 October in the Swiss Arena in Kloten before a sell-out audience. The tournament was organised by ETH and showed how the latest assistive technologies can help people with disabilities in their everyday lives.

Engineers are developing increasingly sophisticated assistive technologies to make life easier for people with disabilities. But what do these devices actually achieve? Do they really meet the needs of their users? And in what direction are they developing? These were among the questions being asked at the world's first Cybathlon, organised by ETH Zurich on 8 October 2016. Some 4,600 visitors packed into the Swiss Arena in Kloten to support 66 teams from different countries at this sell-out event. They watched exciting competitions which provided an impressive demonstration of how far these technologies have already come.

Six disciplines

Contestants pitted themselves against one another in six demanding disciplines geared to the challenges of everyday life. Twelve contestants lined up for the powered leg prosthesis race, and the same number for the powered wheelchair race, the functional electrical stimulation bike race and the brain–computer interface race. Ten contestants took part in the powered arm prosthesis race and eight in the powered exoskeleton race. Due to the competition regulations, however, scores could not be assigned to all the participating teams. A total of seven teams came from Switzerland, including two from ETH Zurich. At the end of the day, a winning team was announced from each of the categories.

The sporting performances were impressive and the event achieved its goal of promoting research and development in assistive technologies. The visionary idea of ETH Professor Robert Riener led to an event with global appeal that not only inspired spectators from all over the world, but also provided a clear demonstration of what technology can achieve when users' needs directly influence the development of these assistive technologies.

International interest

The Cybathlon also attracted a lot of media attention: some 150 international media professionals attended the Cybathlon premiere and reported on the competition. Swiss radio and television broadcast the event live and made it their theme for the day. Various stands were set up where visitors could find out for themselves what modern assistive technology has to offer. They could try to navigate uneven terrain in a wheelchair, for example, or control a computer game by thought processes.

Given the success of the event, a second Cybathlon is planned in four years' time. ■

www.cybathlon.ethz.ch

The goal was not to jump higher or run faster, but to tackle the challenges of everyday life using state-of-the-art, high-precision technical aids.

Cybathlon 2016

A world premiere showcasing man and machine

A surprise victory in the powered arm prosthesis race: using a relatively simple prototype, the beaming winners prevailed against a commercially available high-tech solution. An impressive result and a clear indication that the potential for development of motorised aids is still far from exhausted.

↑
ETH Zurich's goal in organising the Cybathlon is to promote technical solutions that help people with disabilities in the ways they need most. For that reason, everyday tasks were deliberately chosen – such as changing a light bulb, as shown here.

←
The VariLeg exoskeleton developed by ETH students has a special spring mechanism in the knee. This helps the user cope with minor obstacles on uneven surfaces.

After months of intensive muscle and endurance training, competitors in the functional electrical stimulation (FES) bike race put on an exciting show. Electrical stimulation of the athletes' motor nerves allows them to pedal despite paralysis. They control the current supplied to their muscles themselves, allowing them to regulate their speed in relation to their stamina.


CYBA

↑
The technology is already far advanced in some areas; some leg prostheses allow the user to run faster than a person with two natural legs. But when it comes to functions relevant to everyday life, such as walking up stairs, prostheses still leave something to be desired.

→
Teamwork is everything: only trained teams consisting of developers and experienced test users could cope with the tricky challenges presented by the Cybathlon.


zürich

In the brain–computer interface (BCI) race, Cybathlon contestants used the power of their thoughts to control avatars in a computer game developed by the Zurich University of the Arts (ZHdK). In the future, this technology could allow people with quadriplegia to control devices such as wheelchairs or coffee machines, giving them more independence in their everyday lives.


F2
F4
FZ
AF3

“The University’s international outlook, quality of teaching and exchange of ideas across the disciplines help to create the **perfect environment** for nurturing **academic excellence**.”

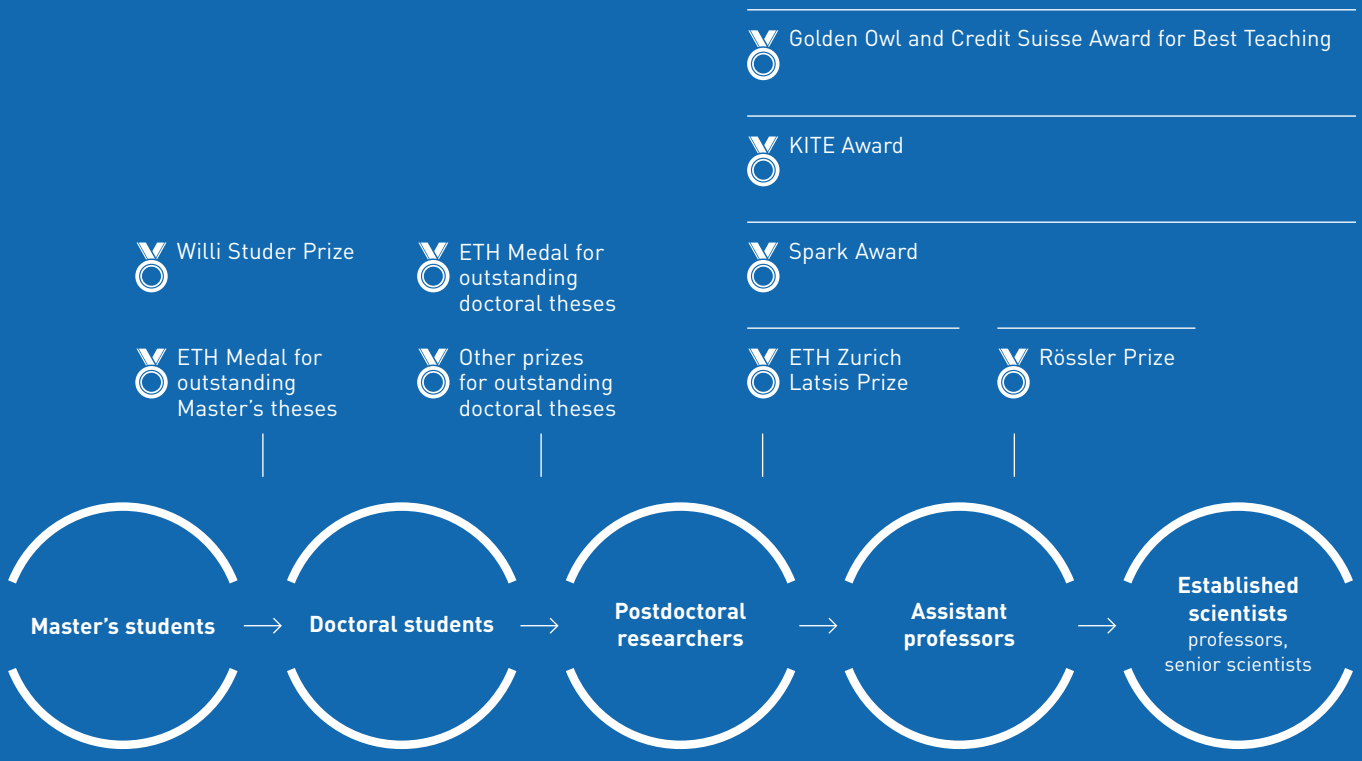
Florian Sonderegger, Bachelor’s student, Mechanical Engineering

Honours and awards

An open work climate with a global outlook, an excellent research infrastructure and a culture of trust that allows enormous flexibility: this is the bedrock on which academic excellence is built at ETH, empowering ETH scientists to win a wide range of prestigious awards. The University's policy is definitely on target, as evidenced by the many prizes that ETH researchers won in 2016, further enhancing our reputation for excellence.

The fact that ETH researchers perform extremely well by international standards is also reflected in the grants awarded by the European Research Council (ERC). In 2016, four professors at ETH Zurich were successful in their applications for ERC Advanced Grants, which provide funding of around 2.5 million Swiss francs. In addition, two female researchers and four male researchers received ERC Starting Grants, which the European Research Council awards to support young talent at the start of their academic careers. Finally, three ETH researchers won ERC Consolidator Grants. Their projects attracted funding of around 2 million Swiss francs each.

Internal ETH honours and awards for outstanding career achievements
www.ethz.ch/prizes



Honorary doctorates and councillors

ETH President Lino Guzzella; Honorary Councillor Thomas Knecht; Thomas F. Stocker and Max Ernst Meyer, both recipients of honorary doctorates; and Rector Sarah M. Springman (from left to right).

Honorary doctorates from ETH Zurich
ETH Zurich awards honorary doctorates to acknowledge recipients' outstanding scientific work. This accolade honours their significant achievements in science, teaching and practice, or in the synthesis of research and practical work.

At ETH Day 2016, the Rector of ETH Zurich awarded honorary doctorates to the following recipients:

Max Ernst Meyer
For his pioneering work on refining the methods employed in the construction of large prestressed concrete bridges and for his exemplary drive and imagination as an engineer.

Professor Thomas F. Stocker
For his seminal research into climate systems and climate change, as well as his enormous contribution in leading the IPCC's Working Group I.

Honorary councillors of ETH Zurich
The title of honorary councillor is awarded to individuals who promote substantial scientific work or fields of scientific activity at ETH Zurich, or who support the University as a whole.

At ETH Day 2016, the President of ETH Zurich conferred the title of honorary councillor on the following individual:

Dr Thomas Knecht
For his outstanding commitment to the promotion of innovation transfer from Swiss universities to society and the economy, especially through founding the Venture competition and the Venture Foundation for supporting innovative start-ups.

Honours and prizes awarded to members of ETH

A

Professor Ruedi Aebersold, D-BIOL
Honorary doctorate, Lund University, Sweden

Professor Markus Aebi, D-BIOL
Tamio Yamakawa Award, Japan Consortium for Glycobiology and Glycotechnology, Japan

Professor Michael Ambühl, D-MTEC
Permanent Honorary Professor, Nanjing Audit University, China

Professor Charalampos Anastasiou, D-PHYS
ERC Advanced Grant, European Research Council, Belgium

Professor Göran Andersson, D-ITET
Foreign Member, National Academy of Engineering, United States of America

Dr Aldo Sady Antognini, D-PHYS
ERC Consolidator Grant, European Research Council, Belgium

Dr Christopher Aylett, D-BIOL
Bayer Early Excellence in Science Award, Bayer Foundation, Germany

B

Professor Nenad Ban, D-BIOL
Distinguished Speaker, Shipley Lecture, Clarkson University, United States of America

Professor Luca Benini, D-ITET
Fellow, Association for Computing Machinery (ACM), United States of America;
Max Van Valkenburg Award, IEEE Circuits and Systems Society, United States of America

Professor Jeffrey Bode, D-CHAB
Belleau Lecture, McGill University, Canada;
David Ginsburg Memorial Lecture, Technion – Israel Institute of Technology, Israel

Professor Helmut Bölcskei, D-ITET
The Padovani Lecture, IEEE Information Theory Society, United States of America

Professor Peter Bühlmann, D-MATH
Fellow, American Statistical Association, United States of America;
IAS Senior Scholar in Residence, Institute for Advanced Studies / Park City Mathematics Institute, United States of America;
Second James Francis Hannan Scholar, Michigan State University, United States of America

C

Professor Srdjan Capkun, D-INFK
ERC Consolidator Grant, European Research Council, Belgium

Professor Erick M. Carreira, D-CHAB
Ziegler Award, Max Planck Institute, Germany

Professor Adam Caruso, D-ARCH
RIBA Stirling Prize for the UK's best new building (Newport Street Gallery, London), Royal Institute of British Architects, United Kingdom

Professor Eleni Chatzi, D-BAUG
T.F. Ogilvie Lecture, Massachusetts Institute of Technology, United States of America

Professor Peter Chen, D-CHAB
Kurt Alder Lecture, University of Cologne, Germany

Professor Kees Christiaanse, D-ARCH
RIBA International Fellowship Award, Royal Institute of British Architects, United Kingdom

Professor Demetrios Christodoulou, D-MATH
Member, Academia Europaea, United Kingdom;
Honorary Professorship in Mathematics, University of Crete, Greece;
Nemitsas Foundation Prize for Mathematics, Nemitsas Foundation, Cyprus

Professor Christophe Copéret, D-CHAB
Max Rössler Prize, ETH Zurich, Switzerland

D

Professor Raffaello D'Andrea, D-MAVT
IEEE Robotics and Automation Award, IEEE, United States of America;
Mid-Career Achievement Award, University of Toronto, Canada

Professor Katrien De Bock, D-HEST
ERC Starting Grant, European Research Council, Belgium

Professor François Diederich, D-CHAB
Barluenga Lectureship, University of Oviedo, Spain;
Irvine Organic Synthesis Lecture, University of California, United States of America;
Nauta Award for Pharmacochemistry, European Federation for Medicinal Chemistry, United Kingdom;
Ole Gisvold Memorial Lecture in Medicinal Chemistry, University of Minnesota, United States of America;
Ordinary Member, European Academy of Sciences and Arts, Austria;
Virgil Boekelheide Lectureship, University of Oregon, United States of America

Professor Günther Dissertori, D-PHYS
Fellow, American Physical Society (APS), United States of America

E

Professor Paul Embrechts, D-MATH
Hung Hing-Ying Distinguished Visiting Professorship in Science and Technology, The Hong Kong University, Hong Kong

Professor Paolo Ermanni, D-MAVT
Sampe Fellow Award, Society for the Advancement of Material and Process Engineering, United States of America

Professor Tilman Esslinger, D-PHYS
Distinguished Ugo Fano Lecture, James Franck Institute, University of Chicago, United States of America

F

Professor Andreas Fichtner, D-ERDW
ERC Starting Grant, European Research Council, Belgium

Professor Manfred Fiebig, D-MATL
ERC Advanced Grant, European Research Council, Belgium

Professor Alessio Figalli, D-MATH
Edith and Peter O'Donnell Awards, The Academy of Medicine, Engineering & Science of Texas, United States of America;
ERC Consolidator Grant, European Research Council, Belgium

Professor Robert J. Flatt, D-BAUG
Acers Fellowship, The American Ceramic Society, United States of America

Professor Martin Fussenegger, D-BSSE
Honorary Professor, East China Normal University, China

G

Professor Jaboury Ghazoul, D-USYS
Outstanding Service Award, Association of Tropical Biology and Conservation, United States of America

Professor Fabio Gramazio, D-ARCH
Pioneering Research Award, Robots in Architecture, Australia

Professor Rachel Grange, D-PHYS
ERC Starting Grant, European Research Council, Belgium

Professor Markus Gross, D-INFK
Member, Swiss Academy of Engineering Sciences (SATW), Switzerland

H

Professor Gerald Haug, D-ERDW
Senator of Geosciences and Spokesperson Class I, German National Academy of Sciences, Germany

Professor Dirk Helbing, D-GESS
Fellowship at World Academy of Art and Science, United States of America

Professor Andreas Hierlemann, D-BSSE
ERC Advanced Grant, European Research Council, Belgium

Professor Christofer Hierold, D-MAVT
Fellow, IEEE, United States of America

Professor Otmar Hilliges, D-INFK
ERC Starting Grant, European Research Council, Belgium

Professor Donald Hilvert, D-CHAB
Biocat Award 2016, International Congress on Biocatalysis, Germany;
Fellow, American Academy of Arts and Sciences, United States of America;
Feodor Lynen Medal, German Society for Biochemistry and Molecular Biology, Germany

Professor Jonathan Home, D-PHYS
ETH Zurich Latsis Prize, Fondation Latsis Internationale, Switzerland

K

Professor James Kirchner, D-USYS
Langbein Lecture, American Geophysical Union, United States of America

Professor Antti Knowles, D-MATH
ERC Starting Grant, European Research Council, Belgium

Professor Matthias Kohler, D-ARCH
Pioneering Research Award, Robots in Architecture, Australia

Professor Johann W. Kolar, D-ITET
Istvan Nagy Award, IEEE PEMC Council, USA

Professor Petros Koumoutsakos, D-MAVT
Moore Distinguished Scholar, California Institute of Technology, United States of America;
Wallace Lecture Series, Massachusetts Institute of Technology, United States of America;
William and Flora Hewlett Foundation Fellow, Harvard University, United States of America

Professor Maksym Kovalenko, D-CHAB
Werner Prize, Swiss Chemical Society, Switzerland

L

Professor Jean-Christophe Leroux, D-CHAB
AAPS Lipid-Based Drug Delivery Outstanding Research Award, United States of America

Professor Jonathan Levine, D-USYS
ODUM Lecturer 2016, University of Georgia, United States of America

Dr Johan Lilliestam, D-USYS
ERC Starting Grant, European Research Council, Belgium

Professor Jörg F. Löffler, D-MATL
DGM Prize, Deutsche Gesellschaft für Materialkunde e.V., Germany

M

Professor Isabelle Mansuy, D-HEST
Knight in the Order of the Legion of Honour, Chancellerie de la Légion d'Honneur, France

Dr David Martinez-Martin, D-BSSE
Excellence Award in Physics, Spanish Professional Association of Physicists, Spain

Professor Ueli Maurer, D-INFK
RSA Award for Excellence in the Field of Mathematics, United States of America

Professor Beat H. Meier, D-CHAB
Member, German National Academy of Sciences, Germany

Dr Matthias Meier, D-ERDW
Paul Niggli Medal, Paul Niggli Foundation, Switzerland

Professor Nicolai Meinshausen, D-MATH
Presidents' Award, Committee of Presidents of Statistical Societies (COPSS), United States of America;
Fellow, Institute of Mathematical Statistics (IMS), United States of America

Professor Frédéric Merkt, D-CHAB
Fellow, American Physical Society (APS), United States of America

Professor Daniel J. Müller, D-BSSE
Member, European Molecular Biology Organisation (EMBO), Germany

Professor Ralph Müller, D-HEST
Russell Severance Springer Visiting Professor, University of California, United States of America

N

Professor Michael A. Nash, D-BSSE
ERC Starting Grant, European Research Council, Belgium

O

Professor Dani Or, D-USYS
John Dalton Medal, European Geosciences Union, Austria

P

Professor Adrian Perrig, D-INFK
Fellow, Association for Computing Machinery (ACM), United States of America

Professor Paola Picotti, D-BIOL
Robert J. Cotter New Investigator Award, US HUPO, United States of America

Dr Margarete Pratschke, D-GESS
Caroline von Humboldt Prize, Humboldt University of Berlin, Germany

Professor Sotiris E. Pratsinis, D-MAVT
Diels-Planck Lecture, Kiel University, Germany

Professor Klaas Prüssmann, D-ITET
Honorary Membership, European Society for Magnetic Resonance in Medicine and Biology, Austria;
Sir Peter Mansfield Lecturer, European Society for Magnetic Resonance in Medicine and Biology, Austria

Professor Alexander Puzrin, D-BAUG
International Research Fellow 2016, University of Newcastle, Australia;
Adjunct Professor, University of Western Australia, Australia

R

Professor Robert Riener, D-HEST
Distinguished Lecture, University of Innsbruck, Austria

Professor Johan Robertsson, D-ERDW
ERC Advanced Grant, European Research Council, Belgium

S

Professor Uwe Sauer, D-BIOL
Member, European Molecular Biology Organisation (EMBO), Germany

Dr Giacomo Scalari, D-PHYS
ERC Consolidator Grant, European Research Council, Belgium

Professor Christoph Schwab, D-MATH
Fellow, Society for Industrial and Applied Mathematics (SIAM), United States of America

Professor Martin E. Schwab, D-HEST
Distinguished Visiting Professorship, Rehabilitation Institute of Chicago, United States of America;
Schellenberg Prize, International Foundation for Research in Paraplegia, Switzerland

Professor Miroslav Sik, D-ARCH
Award for outstanding buildings of the City of Zurich, Public Works Office, Switzerland

Professor Sarah M. Springman, D-BAUG
Honorary doctorate, University of Bern, Switzerland

Professor Aldo Steinfeld, D-MAVT
Frank Kreith Energy Award, American Society of Mechanical Engineers, United States of America;
Member, Pan-American Academy of Engineering, Mexico

Professor Bruno Studer, D-USYS
Günter und Anna Wricke Research Prize, Günter & Anna Wricke Foundation, Germany

T

Professor Matthias Troyer, D-PHYS
Aneesur Rahman Prize for Computational Physics, American Physical Society (APS), United States of America

V

Professor Sara van de Geer, D-MATH
Van Wijngaarden Award, Centrum Wiskunde & Informatica, Netherlands;
Wald Memorial Lectures, Institute of Mathematical Statistics, United States of America

Professor Jan Vermant, D-MATL
Fellow, Society of Rheology, United States of America;
Onsager Professor and Onsager Medal, Norwegian University of Science and Technology, Norway

Professor Viola Vogel, D-HEST
Bergveld Lecture, University of Twente, Netherlands;
Member, European Academy of Science and Art, Austria;
KAUST Distinguished Speakers Series, Saudi Research Science Institute, King Abdullah University of Science and Technology (KAUST), Saudi Arabia

Professor Georg von Krogh, D-MTEC
Fellow, Cambridge Judge Business School, United Kingdom

W

Professor Helma Wennemers, D-CHAB
Paul Janssen Lecture, King's College, United Kingdom;
Pedler Award, Royal Society of Chemistry, United Kingdom

Professor Wendelin Werner, D-MATH
Heinz Gumin Mathematics Prize, Carl-Friedrich von Siemens Foundation, Germany

Professor Heini Wernli, D-USYS
Fellow, European Centre for Medium-Range Weather Forecasts (ECMWF), United Kingdom

Professor Gerhard Wider, D-BIOL
Fellow, International Society of Magnetic Resonance (ISMAR), United States of America

Professor Sean Willett, D-ERDW
Fellow, American Geophysical Union, United States of America;
Member, Academia Europaea, United Kingdom

Professor Thomas Willwacher, D-MATH
EMS Prize, European Mathematical Society, European Union

Professor Kurt Wüthrich, D-BIOL
Dr honoris causa, Universidad Nacional de Córdoba, Argentina;
ShanghaiTech Lecture, SIAIS BioForum, China

Professor Mario Wüthrich, D-MATH
Honorary Professor, Department of Statistical Science, University College London, United Kingdom

For department name abbreviations, visit **www.ethz.ch/departments**

“At ETH, the **same rules** apply to men and women: equal effort brings equal opportunities. I **like** that.”

Arianna Piana, Bachelor’s student, Mathematics

Human resources and infrastructure

ETH Zurich employees are mostly satisfied with their work situation and show a high level of commitment to their employer. These are the findings of the University's latest staff survey. Views on the action plan to promote equal opportunities for women and men were also positive: there has been growing awareness of gender equality at ETH in the last two years and the departments have been taking concrete steps to address this issue.

New trends in teaching and research, along with a steady rise in the number of students and disciplines, require continuous development of the institution's infrastructure. ETH Zurich plans to create new capacity at both its main sites to cater for growing demand. In the centre of the city, ETH is working with University Hospital Zurich, the University of Zurich and the canton and city of Zurich on building developments within the university district. Facilities on the Hönggerberg campus are being further expanded within the existing perimeter. As a first step, a Campus Hönggerberg 2040 masterplan has now been drawn up.

Number of ETH employees by location
at year-end 2016

STAFF NUMBERS

International work environment

With 11,500 employees from Switzerland and abroad, ETH Zurich is one of the biggest employers in the Zurich area. The University offers a varied, international work environment and attractive positions for academics and for staff performing scientific, technical and administrative duties. Expressed in full-time equivalents (FTEs), ETH Zurich employed 9,100.3 people in the reporting year. This figure was stable (+0.8 %) compared with the previous year (9,025.7).

ETH Zurich enjoys an international work environment, with non-Swiss staff making up 55.9 percent (FTEs). The most cosmopolitan groups are academic (68.8 %) and scientific staff (70.0 %).

Besides its international community, the success and quality of ETH Zurich is based on a culture of empowerment, responsibility and trust in the abilities of all its employees.

As a modern employer, ETH Zurich fosters employees' career development and prepares talented young scientists for international careers in science. Its conditions of employment allow a balanced combination of work, family and leisure time. Around a third of employees are women (32.3 % based on FTEs). ■

www.ethz.ch/working

ETH Zurich offers a varied, international work environment.

Staff by function

Full-time equivalents (FTEs) at the end of 2016 (reporting date) or annual average	At the reporting date						Annual average in
					Increase		
	2015 Total	2016 Total	Women, in %	International staff, in %	Absolute	in %	2016 Total
Total staff	**9,025.7**	**9,100.3**	**32.3 %**	**55.9 %**	**74.5**	**0.8 %**	**9,043.2**
of which permanent members of staff	2,814.4	2,897.2	35.8 %	31.3 %	82.8	2.9 %	2,858.5
Professors[1]	**475.2**	**481.3**	**13.8 %**	**68.8 %**	**6.1**	**1.3 %**	**476.2**
Full professors	391.7	391.3	11.6 %	66.4 %	–0.4	–0.1 %	390.6
Assistant professors	83.5	90.0	23.3 %	78.9 %	6.5	7.8 %	85.6
Scientific staff	**5,828.5**	**5,842.6**	**29.2 %**	**70.0 %**	**14.1**	**0.2 %**	**5,825.2**
Senior scientists and permanent scientific staff	253.3	251.7	14.9 %	46.5 %	–1.7	–0.7 %	254.5
Temporary scientific staff	5,218.7	5,235.7	29.5 %	73.7 %	17.0	0.3 %	5 197.1
Senior assistants, scientific staff (temporary)	585.0	617.0	23.2 %	71.5 %	32.1	5.5 %	604.1
Postdoctoral students, scientific research assistants II	1,206.8	1,127.5	29.1 %	88.4 %	–79.2	–6.6 %	1,163.0
Scientific research assistants I	3,427.0	3,491.2	30.8 %	69.4%	64.2	1.9 %	3,429.9
Teaching/research assistants	356.5	355.2	34.2 %	31.7 %	–1.3	–0.4 %	373.6
Technical and administrative staff	**2,553.0**	**2,607.4**	**42.6 %**	**25.1 %**	**54.4**	**2.1 %**	**2,571.8**
of which permanent members of staff	2,176.3	2,256.6	42.3 %	23.6 %	80.3	3.7 %	2,217.4
Technical and IT staff	1,367.5	1,385.1	18.9 %	29.7 %	17.6	1.3 %	1,371.6
Administrative staff	1,185.5	1,222.3	69.5 %	19.8 %	36.8	3.1 %	1,200.3
Apprentices	**169.0**	**169.0**	**31.4 %**	**10.1 %**	**0.0**	**0.0 %**	**169.9**

[1] Headcount 2016: 509 (including externally employed dual professors).

www.ethz.ch/personalstatistik

Staff by area

Full-time equivalents (FTEs) at the end of 2016 (reporting date) or annual average[1]	At the reporting date				Increase		Annual average in
	2015 Total	2016 Total	Women, in %	International staff, in %	Absolute	in %	2016 Total
Total staff	**9,025.7**	**9,100.3**	**32.3 %**	**55.9 %**	**74.5**	**0.8 %**	**9,043.2**
Departmental total	**7,490.4**	**7,514.3**	**30.9 %**	**62.2 %**	**23.9**	**0.3 %**	7,477.3
Architecture and Building Sciences	1,015.0	1,014.8	32.6 %	55.1 %	–0.3	0.0 %	1,002.1
Architecture	441.6	443.3	38.1 %	54.3 %	1.7	0.4 %	433.4
Civil, Environmental and Geomatic Engineering	573.5	571.5	28.3 %	55.7 %	–2.0	–0.3 %	568.8
Engineering Sciences	2,146.4	2,194.9	20.4 %	66.5 %	48.5	2.3 %	2,150.9
Mechanical and Process Engineering	688.6	730.7	17.1 %	61.8 %	42.1	6.1 %	698.8
Information Technology and Electrical Engineering	561.8	570.7	16.9 %	64.0 %	8.9	1.6 %	561.3
Computer Science	366.3	376.7	19.3 %	68.2 %	10.4	2.8 %	372.5
Materials	237.7	224.0	27.0 %	68.3 %	–13.8	–5.8 %	228.7
Biosystems Science and Engineering	292.0	292.9	32.3 %	79.6 %	0.8	0.3 %	289.7
Natural Sciences and Mathematics	2,347.6	2,289.1	30.5 %	62.4 %	–58.5	–2.5 %	2,339.2
Mathematics	258.3	246.4	22.3 %	65.5 %	–11.8	–4.6 %	287.8
Physics	630.8	609.2	18.6 %	58.0 %	–21.6	–3.4 %	612.0
Chemistry and Applies Biosciences	814.7	810.7	31.8 %	60.7 %	–4.0	–0.5 %	806.5
Biology	643.8	622.7	43.8 %	67.7 %	–21.1	–3.3 %	633.0
System-oriented Natural Sciences	1,427.0	1,426.1	43.8 %	60.2 %	–0.9	–0.1 %	1 412.0
Earth Sciences	325.9	329.5	33.3 %	66.9 %	3.7	1.1 %	326.9
Environmental Systems Science	659.3	650.9	45.6 %	59.3 %	–8.4	–1.3 %	640.8
Health Sciences and Technology	441.8	445.7	48.8 %	56.5 %	3.8	0.9 %	444.3
Management and Social Sciences	554.4	589.5	37.3 %	63.0 %	35.1	6.3 %	573.0
Management, Technology and Economics	305.3	321.5	36.4 %	68.4 %	16.3	5.3 %	317.6
Humanities, Social and Political Sciences	249.1	268.0	38.3 %	56.6 %	18.9	7.6 %	255.4
Extra-departmental teaching and research units, others[2]	**310.1**	**332.4**	**33.0 %**	**52.5 %**	**22.2**	**7.2 %**	**323.1**
Executive Board, staff units and administrative departments	**1,225.2**	**1,253.6**	**40.2 %**	**19.1 %**	**28.4**	**2.3 %**	**1,242.8**
Executive Board and staff units	101.4	113.9	60.8 %	26.8 %	12.5	12.3 %	108.3
Administrative departments	1,123.8	1,139.7	38.1 %	18.3 %	15.9	1.4 %	1,134.4
Corporate Communications	26.1	29.4	66.7 %	24.1 %	3.3	12.6 %	27.7
Academic Services	58.1	59.3	64.6 %	14.7 %	1.2	2.0 %	57.9
Educational Development and Technology	19.3	24.5	49.8 %	24.9 %	5.2	26.9 %	22.4
Student Services	15.5	16.4	75.5 %	3.7 %	0.9	5.8 %	15.4
Controlling	21.6	20.1	56.2 %	10.0 %	–1.5	–6.9 %	20.7
Financial Services	12.8	15.8	41.8 %	10.1 %	3.0	23.4 %	15.2
Accounting	45.1	39.4	49.0 %	19.3 %	–5.7	–12.6 %	40.7
Facility Management	194.6	191.7	18.3 %	23.2 %	–2.8	–1.5 %	193.9
ETH Bibliothek	228.2	223.5	59.5 %	18.3 %	–4.6	–2.0 %	227.0
Real Estate	70.0	66.9	28.8 %	14.6 %	–3.1	–4.4 %	68.3
IT Services	247.0	254.1	12.7 %	21.6 %	7.1	2.9 %	250.1
Human Resources	58.0	64.1	70.1 %	7.3 %	6.1	10.5 %	62.8
Services	89.3	96.1	40.5 %	12.8 %	6.8	7.6 %	93.5
Safety, Security, Health and Environment	38.4	38.5	30.4 %	20.0 %	0.1	0.3 %	38.8

[1] The 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 2016.

[2] "Extra-departmental teaching and research units, others" refers to Singapore–ETH Centre, Institute of Science, Technology, and Policy (ISTP), Collegium Helveticum, Congressi Stefano Franscini, ETH Institute for Theoretical Studies (ITS), Wyss Translational Center Zurich (WTZ), Functional Genomic Center Zurich, NEXUS Personalized Health Technologies, FIRST-Lab, B&R Nanotech. Center, ScopeM, ETH Phenomics Center, Swiss Seismological Service (SED), CSCS, Agrovet-Strickhof and other central projects.

GENDER ACTION PLAN

Gender equality well established

For the last two years, ETH Zurich has had an action plan in place to promote equal opportunities for women and men. Its effectiveness was reviewed in 2016: there is greater awareness of gender equality issues and the departments are actively committed.

In 2014, the ETH Executive Board launched a Gender Action Plan setting out how the University aims to achieve a gender balance and who is responsible for its implementation. The Gender Action Plan is focused on four areas:

1. Increasing the proportion of women among students, researchers and professors
2. Integrating gender-specific aspects into teaching and research
3. Facilitating work/life balance
4. Preventing and combating sexual harassment and discrimination.

An evaluation of progress to date was carried out in 2016. While the number of female students and professors has not risen appreciably, the Gender Action Plan is already having positive effects on ETH's culture, according to Associate Vice President Equal Opportunities, Renate Schubert. The evaluation shows that awareness of gender equality issues has increased considerably within ETH and the departments have introduced a large number of measures.

Support for mothers and fathers

Measures implemented by the departments include those aimed at improving the balance between work or studies and family life. The Department of Humanities, Social and Political Sciences, for example, pays family allowances for its doctoral students from a departmental budget rather than the budgets of individual research groups. This helps to reduce the negative financial incentive of favouring candidates with no children during the selection process.

The Department of Earth Sciences set up a "family room" in spring 2016. This helps ETH members if they have a temporary childcare problem. As well as workspace, there are play facilities for children.

Robert Gnehm Grants were introduced across ETH in late summer 2016. These provide financial support to cover any additional childcare costs incurred by researchers with young children when they go away to present research results at international conferences.

Increasing the quality of training

ETH Zurich is committed to creating a working and learning culture free from any form of discrimination – one that instils an equal sense of belonging in both women and men. In 2016 a survey was conducted among first-year students, asking how the conditions for studying can be improved for women and men. ■

www.equal.ethz.ch

Awareness of gender equality issues has increased considerably at ETH Zurich. The departments have introduced a large number of measures.

SOCIETY IN SCIENCE

Three new Fellows

Nine new Fellows were appointed in 2016 under the Society in Science funding programme. Three of these young researchers – Matthieu Emmanuel Galvez, Vanessa Rampton and Takuya Segawa – graduated from ETH Zurich. Society in Science is based at ETH Zurich and was endowed through a series of donations made by entrepreneur Branco Weiss, who died in 2010.

Earth scientist Matthieu Galvez is studying the mechanisms and dynamics of geological changes on the Earth's surface. Social scientist Vanessa Rampton is exploring the ambiguities inherent in the application of science to medical practice. Chemist Takuya Segawa is developing new analytical methods for characterising single biomolecules inside cells. ■

www.society-in-science.org

CAREER AND FAMILY

Support for parents

Reconciling work and family is a focal point of the Gender Action Plan. ETH Zurich therefore extended its family support services in the areas of maternity and childcare in 2016. Since the autumn, employees who are expecting a baby receive the "Parenthood" leaflet and "Maternity Discussion Guidelines", offering a practical guide to the rights and obligations associated with the birth of a child. In addition, kihz – a foundation supported by the University of Zurich and ETH Zurich – opened the kihz Feyerabend daycare centre on the Hönggerberg campus for children from four months to kindergarten age.

kihz Flex was also launched as a one-year pilot project. This supervised nursery provides flexible, needs-based temporary childcare with professional carers, regardless of the parents' working hours and without a long-term contractual commitment. ■

www.ethz.ch/family
www.ethz.ch/maternity

EMPLOYEE SURVEY

Satisfied employees

Employees at ETH Zurich are very or largely satisfied with their work situation. They identify with their employer and feel a strong sense of loyalty.

In spring 2016 ETH Zurich conducted a survey among its employees, asking them to assess their work situation at the University. In the opinion of employees, ETH Zurich's main strengths include "Image" and "Diversity", together with "Attractive work content" and "Reconciliation of work and family".

A total of 4,785 ETH Zurich employees participated in the survey (response rate: 55.5 percent). 71 percent of employees at ETH Zurich are very or largely satisfied with their work situation. Employees see ETH Zurich as an attractive and family-friendly employer that is open to innovation. They appreciate being able to use their skills and knowledge in their work. ETH employees rate the pay as good overall, valuing the fringe benefits more than market competitiveness.

ETH employees gave positive, but slightly lower scores for the areas of "Working environment", "Health", "Use of salary levels for doctoral students and consideration of teaching activities" and "Leadership and development". Since these issues have a strong impact on job satisfaction and leave room for improvement, the ETH Executive Board singled out these four areas for further attention and action. ■

www.ethz.ch/employee-survey

STAFF PARTY

One ETH

Around 4,000 ETH employees and their families came to the staff party on the Hönggerberg campus. They ate and drank, danced and chatted, with the theme of this year's event celebrating "One ETH".

People from all over the world meet at ETH; together they develop their various talents, ideas and knowledge to contribute to the success of our University. ETH Zurich's employees celebrated this diversity at the annual togETHer staff party with a range of cultural and culinary delights from all corners of the globe.

Around 4,000 technical, administrative, research and teaching staff, together with their families and former colleagues, attended the sixth togETHer staff party. The motto of this year's event, held in glorious summer weather on the Hönggerberg campus, was "One ETH".

The ETH spirit – a culture of responsibility

In his address, ETH President Lino Guzzella explained that togETHer 2016 was an opportunity for the whole management team to thank all University staff for their great and unfailing commitment. Referring to the theme of "One ETH", he called on all members of the University to work together in developing the ETH spirit, pointing out that the University's success is built not only on talent and ability, but also on a strong sense of community. With its bottom-up culture and flat hierarchical structures, ETH Zurich offers the perfect environment for this, but responsibility is an equally vital component. For the ETH President, this means that all staff must work together as "One ETH". This is the best way to uphold the position of ETH as Switzerland's flagship university at the top of the world rankings.

The party was a very special occasion for Lorenz Hurni, Professor of Cartography. His skill in fostering an optimum balance between work and family life won him the 2016 Golden Tricycle, an award to honour managers who create particularly family-friendly working conditions for their teams.

That means flexibility and mutual trust, but also allowing people to work from home, arranging meetings around nursery times and taking a flexible approach to part-time working. ■

www.ethz.ch/together-en

Under the motto "One ETH", the staff party fostered a sense of community among ETH staff from all over the world.

New professorships

FULL PROFESSORS

New appointments

Professor Ioannis Anastasopoulos,
for Geotechnical Engineering (1.3.2016), D-BAUG, formerly Professor at the University of Dundee, UK

Professor David N. Bresch,
for Weather and Climate Risks (1.9.2016), D-USYS, having previously held a management-level position in the private sector, Switzerland

Professor Patrick Cheridito,
for Insurance Mathematics (1.6.2016), D-MATH, formerly Associate Professor at Princeton University, USA

Professor Bart Clarysse,
for Entrepreneurship (1.3.2016), D-MTEC, formerly Professor at Imperial College London, UK

Professor Eric Dufresne,
for Soft and Living Materials (1.1.2016), D-MATL, formerly Tenured Associate Professor at Yale University, USA

Professor Alessio Figalli,
for Mathematics (1.9.2016), D-MATH, formerly Professor at the University of Texas at Austin, USA

Professor Emilio Frazzoli,
for Dynamic Systems and Control (1.10.2016), D-MAVT, formerly Professor at the Massachusetts Institute of Technology, USA

Professor Stefan Holzer,
for Building Research and Construction History (1.7.2016), D-ARCH, formerly Professor at the University of the Federal Armed Forces Munich, Germany

Professor Onur Mutlu,
for Computer Science (1.5.2016), D-INFK, formerly Associate Professor at Carnegie Mellon University, USA

Professor Gunnar Rätsch,
for Biomedical Informatics (1.5.2016), D-INFK, formerly Associate Professor at the Memorial Sloan Kettering Cancer Center, USA

Professor Heather Stoll,
for Climate Geology (1.9.2016), D-ERDW, formerly Professor at the University of Oviedo, Spain

Professor Roy Wagner,
for History and Philosophy of Mathematical Sciences (1.8.2016), D-GESS, formerly Research Fellow at Tel Aviv University, Israel

Promotions

Professor Reto Knutti,
for Climate Physics (1.8.2016), D-USYS, formerly Associate Professor in the same subject area, Switzerland

Professor Marloes H. Maathuis,
for Statistics (1.8.2016), D-MATH, formerly Associate Professor in the same subject area, Switzerland

Professor Konrad Schindler,
for Photogrammetry (1.8.2016), D-BAUG, formerly Associate Professor in the same subject area, Switzerland

Professor Sonia Seneviratne,
for Land–Climate Dynamics (1.10.2016), D-USYS, formerly Associate Professor in the same subject area, Switzerland

Professor Shana Sturla,
for Toxicology (1.4.2016), D-HEST, formerly Associate Professor in the same subject area, Switzerland

Professor Samuel Zeeman,
for Plant Biochemistry (1.6.2016), D-BIOL, formerly Associate Professor in the same subject area, Switzerland

ASSOCIATE PROFESSORS

Professor Robert Finger,
for Agricultural Economics and Policy (1.1.2016), D-MTEC, formerly Professor at Rheinische Friedrich-Wilhelms University, Bonn, Germany

Professor Mathieu Luisier,
for Computational Nanoelectronics (1.10.2016), D-ITET, formerly Assistant Professor at ETH Zurich, Switzerland

Professor Laura Nyström,
for Food Biochemistry (1.10.2016), D-HEST, formerly Assistant Professor (tenure track) at ETH Zurich, Switzerland

Professor Bruno Studer,
for Molecular Plant Breeding (1.6.2016), D-USYS, formerly Assistant Professor (SNSF) at ETH Zurich, Switzerland

Professor Jing Wang,
for Air Quality and Particle Technology (1.8.2016), D-BAUG, formerly Assistant Professor (tenure track) at ETH Zurich, Switzerland

Professor Thomas Hans Willwacher,
for Mathematics (1.5.2016), D-MATH, formerly Assistant Professor at the University of Zurich, Switzerland

ASSISTANT PROFESSORS

New appointments

Professor Rima Alaifari,
for Applied Mathematics (1.10.2016), D-MATH, formerly a postdoctoral researcher at ETH Zurich, Switzerland

Professor Paolo Arosio,
for Biochemical Engineering (1.5.2016), D-CHAB, formerly a postdoctoral researcher at the University of Cambridge, UK

Professor Sebastiano Cantalupo,
for Cosmic Structure Formation (1.6.2016), D-PHYS, formerly Senior Assistant at ETH Zurich

Professor Alessandro Carlotto,
for Mathematics (1.9.2016), D-MATH, formerly Junior Research Fellow at ETH Zurich

Professor Benjamin Dillenburger,
for Digital Building Technologies (1.1.2016), D-ARCH, formerly Assistant Professor at the University of Toronto, Canada

Professor Nathalie Dubois,
for Paleolimnology (1.10.2016), D-ERDW, formerly Group Leader at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG), Switzerland

Professor Collin Ewald,
for Extracellular Matrix Regeneration (1.6.2016), D-HEST, formerly a postdoctoral researcher at ETH Zurich, Switzerland

Professor Daniel Farinotti,
for Glaciology (1.8.2016), D-BAUG, formerly a senior scientific staff member at the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Switzerland

Professor Mohsen Ghaffari,
for Computer Science (1.9.2016), D-INFK, formerly a doctoral student at the Massachusetts Institute of Technology, USA

Professor Benjamin Grewe,
for Systems and Circuits Neuroinformatics (1.10.2016), D-ITET, formerly a postdoctoral research fellow at Stanford University, USA

Professor Maryam Kamgarpour,
for Control Systems (1.4.2016), D-ITET, formerly a postdoctoral fellow at ETH Zurich

Professor Ender Konukoglu,
for Biomedical Image Computing (1.8.2016), D-ITET, formerly an instructor at Harvard Medical School and at Massachusetts General Hospital, USA

Professor Alexander Mathys,
for Sustainable Food Processing (1.1.2016), D-HEST, formerly Head of Department at the German Institute of Food Technologies, Germany

Professor Michael Nash,
for Engineering of Synthetic Systems (1.9.2016), D-BSSE, formerly Group Leader at Ludwig Maximilian University, Munich, Germany, under a Branco Weiss Fellowship from ETH Zurich, Switzerland

Professor Torbjörn Netland,
for Production and Operations Management (1.9.2016), D-MTEC, formerly Associate Professor at the Norwegian University of Science and Technology, Norway

Professor Randall Platt,
for Biological Engineering (1.10.2016), D-BSSE, formerly a postdoctoral fellow at the Massachusetts Institute of Technology, USA

Professor Jeremy Richardson,
for Theoretical Molecular Quantum Dynamics (1.9.2016), D-CHAB, formerly Junior Research Fellow at the University of Durham, UK

Professor Ankit Singla,
for Computer Science (1.1.2016), D-INFK, formerly a doctoral student at the University of Illinois, Urbana-Champaign, USA

Professor Berend Snijder,
for Molecular Systems Biology (1.9.2016), D-BIOL, formerly a postdoctoral fellow at the Austrian Academy of Sciences, Austria

Professor Shinichi Sunagawa,
for Microbiome Research (1.7.2016), D-BIOL, formerly Staff Scientist at the European Molecular Biology Laboratory, Germany

Professor Konrad Tiefenbacher,
for Synthesis of Functional Modules (1.6.2016), D-BSSE, formerly Junior Professor at the Technical University of Munich, Germany

Professor Karin Würtz-Kozak,
for Immunoengineering and Regenerative Medicine (1.7.2016), D-HEST, formerly Senior Assistant and Lecturer at ETH Zurich

Professor Ce Zhang,
for Computer Science (1.9.2016), D-INFK, formerly a postdoctoral researcher at Stanford University, USA

Professor Oded Zilberberg,
for Quantum Condensed Matter Theory (1.6.2016), D-PHYS, formerly a research associate in the research centre of a well-known Swiss company

ADJUNCT PROFESSORS

Professor Thomas Driesner,
D-ERDW, Senior Lecturer and Senior Scientist

Professor Ita Heinze-Greenberg,
D-ARCH, Senior Scientist and Lecturer

Professor Andreas Kunz,
D-MAVT, Senior Lecturer and Senior Scientist

Professor Andreas Rigling,
D-USYS, Lecturer

For department name abbreviations, visit **www.ethz.ch/departments**

ZURICH CITY UNIVERSITY DISTRICT

The university district is taking shape

New trends in teaching and research, as well as growing numbers of students and disciplines, require a new and flexible infrastructure. To meet this need, ETH Zurich is working with partners to plan the future of Zurich's university district.

The Zurich City University District comprising the University of Zurich, ETH and University Hospital Zurich.

ETH has joined forces with University Hospital Zurich, the University of Zurich and the canton and city of Zurich to plan the ongoing development of the Zurich City University District. An important milestone was reached in 2016 when the Cantonal Parliament's Committee for Planning and Construction approved the partial revision of the cantonal structure plan for the university district and passed it to the Cantonal Parliament for a decision. The structure plan lays out the long-term principles of the spatial development.

ETH Zurich believes the changes to the structure plan are an opportunity to take advantage of the unique proximity of the University Hospital, the University of Zurich and ETH Zurich to develop medical research at the interface of natural science, engineering and medicine.

A strategy of consolidating its existing locations should make it easier for ETH Zurich students and researchers across all faculties and institutions to meet face to face and share infrastructure. In this way, the University fosters creativity, innovation and the exchange of knowledge across disciplines.

Development in the Zurich region is to focus on ETH Zurich's two main locations, namely the Zentrum and Hönggerberg campuses, with most of the new building work to take place at Hönggerberg. The new development plans for the city's university district focus on the Schmelzberg site on Sternwartstrasse. A new building for medical teaching, research and cooperation will be built here over the next decade. The GLC research and development building will also support cooperation in medicine. The GLC is being built on the basis of the legally binding cantonal structure plan of 2007. Completion is planned for 2020. Groundworks, excavation and slope stabilisation started in 2016. ■

www.hochschulgebiet.zh.ch
www.ethz.ch/mk-hgzz-en

ETH HÖNGGERBERG CAMPUS

Goals for 2040

The number of students and researchers is rising and spatial needs for teaching and research are changing. This calls for long-term spatial development strategies. In the Zurich region, ETH is focusing its development efforts on its two main locations, the Zentrum and Hönggerberg campuses. In doing so, it is following the principle of "consolidation before expansion". Hönggerberg is to be developed as an attractive campus that befits ETH Zurich as a world-class centre of teaching and research while also being able to accommodate future growth.

To realise the construction projects planned at Hönggerberg beyond 2020, the special building regulations and other cantonal and local-authority planning rules are to be revised. With this in view, a trial planning process was carried out in 2015 to examine possible urban development strategies. A concept developed by the EM2N planning consultancy was recommended as the basis for the 2040 masterplan. This proposes consolidating the campus to form a compact island with external portals and appropriate height development". The Campus Hönggerberg 2040 masterplan updates the Science City masterplan from 2005. ■

www.ethz.ch/masterplan2040-en

GASTRONOMY

Hönggerberg has a new restaurant

The new Bellavista restaurant on the Hönggerberg campus opened in October 2016. Bellavista is ETH Zurich's first restaurant expressly designed with external guests in mind, and is likely to be a popular meeting place for the University's staff and students and their guests.

The restaurant offers views across Zurich's Affoltern district and superior à-la-carte cuisine. The lunchtime menu features a variety of options, including three-course meals. As well as a classic restaurant area and terrace, there is a section with high tables and a lounge. Finally, there is a bar serving drinks and snacks from 9 a.m. to 9 p.m. ■

www.ethz.ch/bellavista

STUDENT ACCOMMODATION

Living on the Hönggerberg campus

ETH's Hönggerberg campus is not only a place of teaching and research, it is also somewhere people live. Since the start of the new semester in September 2016, the campus has been home to around 900 students.

ETH Zurich completed the new student accommodation on its Hönggerberg campus in July 2016. The Luzerner Pensionskasse (Lucerne Pension Fund) and Swiss Life were granted a leasehold to build two new buildings, HWW and HWO, in the south-west part of the campus. Some 900 students moved into the five buildings in September. The intention is to provide not only housing but also a home, therefore the residential facilities include many communal spaces, as well as retail premises that are let to businesses.

Plenty of room to socialise

Built by the Luzerner Pensionskasse, the HWW residential facility comprises one six-storey and one seven-storey residence with 404 student rooms and 23 ateliers intended for commercial use. Tenants include a hairdressing salon, a bike shop, a restaurant, an architect/film producer and an artist. The student accommodation comprises individual studios as well as two-room and six-room shared apartments. Each room comes with a private bathroom. Communal areas and open spaces on each floor provide ample space for residents to socialise. The rooms are very popular with students – all the residential units are fully let. The facility carries the green label Minergie P-Eco.

Right next door are the three visually interconnected HWO buildings developed by Swiss Life. Here, 498 accommodation units are made up of shared flats and individual studios. A landscaped courtyard and various communal spaces provide a high quality of life and space for students to meet up. An extra nursery occupies spacious premises on the ground floor. Student workspaces are also provided here. ETH Zurich plans to establish its Archives of the Institute for the History and Theory of Architecture in the building's basement. The residential units in HWO also met with high demand and are now fully let.

An opportunity for students and ETH alike

ETH Rector Sarah Springman says that ETH Zurich aims to create the best possible conditions for students to support their learning – and these two buildings are ideally suited to that purpose, thanks to their infrastructure and proximity to lecture halls and labs. The residential buildings are also an opportunity to inject life into the campus. To promote the social aspects of campus life, students have set up HöNK, the Hönggerberg neighbourhood committee. ■

www.ethz.ch/constructionprojects

ARCH_TEC_LAB

Construction research

The Arch_Tec_Lab demonstrates how digitalisation can contribute to resource-efficient, compact and emission-free construction. Six Chairs at ETH Zurich worked together to develop the innovative building as a prototype.

The largely digital planning and construction process took six years and involved architects, civil engineers, building service engineers and construction physicists from six Chairs at the Institute of Technology in Architecture at ETH Zurich. The Arch_Tec_Lab embodies sustainability at every level. The new building shows how digital technologies and collaborative planning processes can be used to deliver resource-efficient, compact construction.

Lightweight wood and steel

To be able to build on existing structures, the scientists focused on lightweight construction technology and smaller dimensions. Wood was chosen for the roof structure and steel for the load-bearing skeleton, as these materials have optimum stiffness-to-weight ratios. In addition, the steel structure does without supporting cores and shafts: on the one hand this makes flexible use of space, while on the other hand allowing the interior design to be adapted to changing needs.

A key feature of the Arch_Tec_Lab is the curved timber roof, which was entirely prefabricated by a gantry robot. This was done using an integrated digital planning and production process developed under the supervision of the ETH Chair of Architecture and Digital Fabrication. The result was a roof structure measuring approximately 2,300 square metres, arching over the open upper storeys of the building with elegant curves and changing light patterns.

Zero-emissions technology developed at ETH Zurich since 2010 is used to minimise the building's carbon footprint. ■

www.ita.arch.ethz.ch

“ETH Zurich has an important **role model function** in society – it should set an example where **sustainability** is concerned.”

Guillem Bonet Filella, Bachelor’s student, Geomatic Engineering and Planning

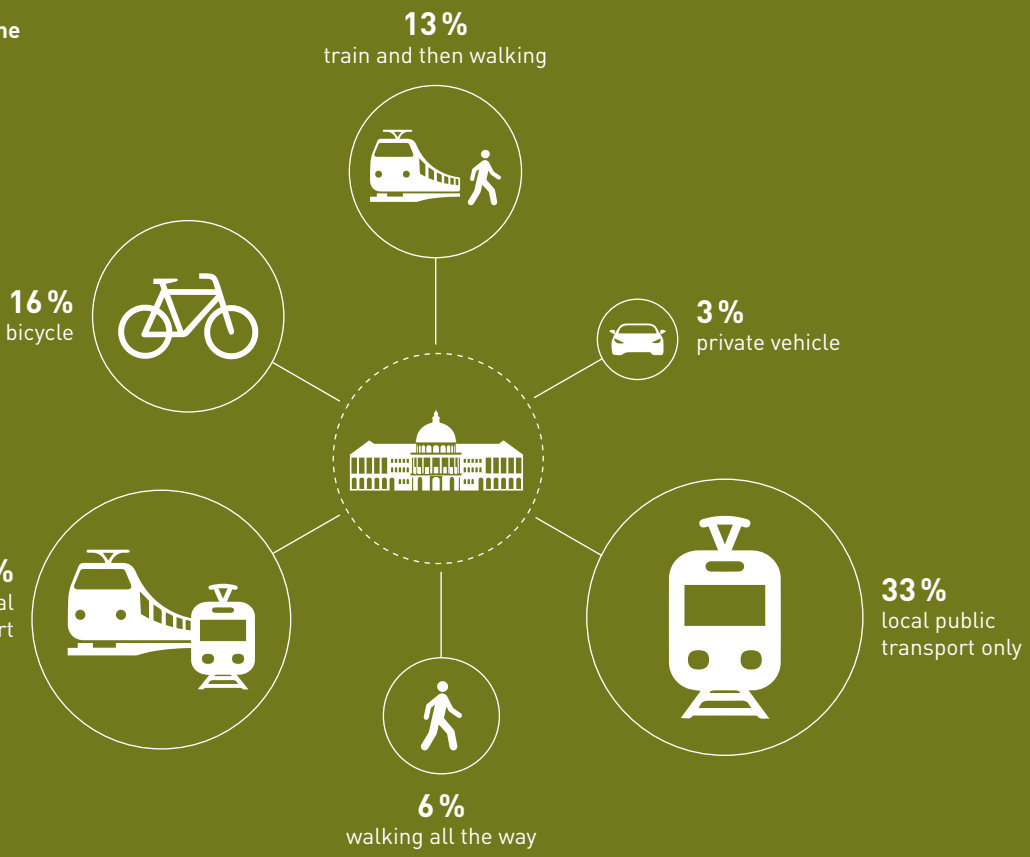
Governance and sustainability

ETH Zurich has a sound leadership structure that combines a distinctly presidential system with broad participation rights. This system has played a key role in delivering successful outcomes for the University over time.

The University's risk management system also makes an important contribution to the sustainable success of the institution. Risk management at ETH Zurich takes account of potential internal as well as external risks, and is guided by internationally established standards. Risks are continuously analysed and monitored as part of a systematic process – especially those which could potentially harm the University's reputation. Appropriate measures are in place to increase risk awareness at ETH Zurich and reduce risk exposure to an acceptable minimum.

ETH Zurich is one of the leading universities in energy, environmental and sustainability research. It is also one of the few universities in Switzerland to have placed sustainability on the agenda at the highest decision-making level, making it a matter for the President. ETH Zurich documents its commitment to sustainable development in its Sustainability Report, which this year is being published at the same time as the Annual Report. It provides information on key indicators and current projects undertaken by the University, such as the mobility platform founded in 2016 with the aim of reducing CO_2 emissions and energy consumption in the areas of campus mobility, business trips and logistics.

Preferred mode of transport to the Zurich city university district
2016 survey



ETH Zurich governance

Optimal organisational structure

ETH Zurich's characteristic leadership structure combines a distinctly presidential system with broad participation rights. This style of governance typifies the ETH culture.

The ETH president carries overall responsibility, specifically in the fields of strategy and finance, and makes proposals to the ETH Board concerning the nomination of vice presidents and professors. This is counterbalanced by a well-established system of participation, which guarantees the robustness and broad acceptance of the decisions taken, as a quality-assurance check across the whole institution. Within this broad-based decision-making process, it is not only the Executive Board that plays a central role, but also the academic departments, which bring together the members of ETH Zurich who work in a specific scientific field, as well as the University Assembly. Based on the principle of equal representation, the Assembly is made up of elected representatives from all four university groups: faculty, scientific staff, students, and administrative and technical staff.

Executive Board

The Executive Board is the supreme governing body of ETH Zurich. It is made up of the President, the Rector (Vice President Teaching, nominated by the professors), Vice President Research and Corporate Relations, Vice President Finance and Controlling, and Vice President Human Resources and Infrastructure. The Executive Board ensures that the University fulfils its social and economic responsibilities. It meets twice a month and is responsible for enacting study programme regulations, setting up or closing down departments and other units, such as interdepartmental centres of excellence, and for ensuring the overall quality of the institution. To this end, it carries out regular departmental evaluations, among other things. The President also consults with the Executive Board on all matters relating to strategy and finance.

The Executive Board is supported in its decision-making by a number of advisory committees, namely in the fields of strategy, teaching and research. The Rector is supported in her area of responsibility by vice rectors, while the President draws on the support of various senior and associate vice presidents with special tasks assigned to them. Ombudspersons, or trusted intermediaries in the case of research-specific disputes, uphold the rights of ETH members when conflicts occur.

Departments

The departments are responsible for their own strategic planning, running their degree courses and coordinating their research. In addition to this, several departments provide teaching services for degree courses run by other departments. This is because, for reasons of quality, the teaching of foundation science subjects is undertaken by the respective department for all students across the entire University. The President distributes funds to the departments each year to finance this provision, which the departments manage autonomously. In doing so, the departments ensure an appropriate provision of professorships as the fundamental operating unit of ETH Zurich, within the context of ETH's culture of empowerment.

The supreme authority within each ETH department is the Department Conference. It includes all professors and a representative of the remaining faculty within each department, as well as representatives of the scientific staff, students and administrative and technical staff. It meets at least twice per semester, and is responsible for planning and defining the scope of professorships, preparing degree-related regulations for approval by the Executive Board, nominating departmental heads for approval by the President, and electing directors of studies. The Professors' Conference, which includes all professors, makes proposals to the President regarding the promotion of professors and the awarding of professorial titles.

Study programme regulations are decided on by the respective department conference and approved by the Executive Board. They are drawn up by the teaching commission of the individual department, which is made up of representatives of the faculty, scientific staff, students, and administrative and technical staff according to the principle of equal representation. In other words, at the departmental level, particularly in relation to curriculum development and course design, the system of participation which is typical for ETH becomes one of comprehensive co-determination.

Interaction between Executive Board and departments

The institutional dialogue between the Executive Board and departmental levels 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. The Conference of the Heads of Department, which comprises heads of department and members of the Executive Board, meets once a month. It concerns itself with overarching questions relating to strategy and planning, teaching and research. It serves the interests of mutual information exchange and the establishment of best practice. At the Conference of Directors of Study, the directors of study at departmental level address questions concerning study programmes and examinations under the leadership of the Rector. Annual dialogues between the Executive Board and departmental management teams ensure that the success of each department is monitored, and departmental planning – especially in relation to professorships – kept up to date.

Flexibility breeds success
ETH Zurich has consciously opted for a flexible departmental structure with heads of department actively involved in science. This ensures diversity and the scope for development necessary for long-term scientific success. Because the Executive Board has the freedom to change the University's articles of association in relation to organisational matters, ETH Zurich can quickly adapt the structure of the Executive Board and the University's departments to take account of altered circumstances.

Organisation chart 2016

As of 31 December 2016

Ombudspersons | **University Assembly**

Executive Board and Administration

Executive Board and General Secretariat	**President** **Professor Lino Guzzella**				
	Rector **Professor Sarah Springman**	**Vice President Research and Corporate Relations** **Professor Detlef Günther**	**Vice President Finance and Controlling** **Dr Robert Perich**	**Vice President Human Resources and Infrastructure** **Professor Ulrich Weidmann**	**Secretary General** **Katharina Polger Ruloff**
Vice Rectors (VR) and Delegates	Delegates for: – ETH Global – Equal Opportunities – Sustainability	VRs for: – Study Programmes – Curriculum Development – Doctoral Studies – Continuing Education			
Staff units	– President's Staff – Office for Faculty Affairs – ETH Global – ETH Sustainability – Office of Strategic Development	– Rector's Staff	– Office of Research – EU GrantsAccess – ETH transfer		– Office of Resources	– Legal Office
Administrative departments	– Corporate Communications	– Academic Services – Student Services – Educational Development & Technology		– Controlling – Accounting – Financial Services	– Human Resources – Real Estate – Facility Management – IT Services – ETH Bibliothek – Services – Safety, Security, Health and Environment	

Departments

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

For teaching and research facilities outside the departments see: **www.ethz.ch/organisation-en**

ETH Zurich Executive Board 2016

As of 31 December 2016

Detlef Günther (1963) has been Assistant Professor (since October 1998), Associate Professor (since 2003) and Full Professor (since February 2008) of Trace Element and Microanalysis at the Laboratory of Inorganic Chemistry at ETH Zurich. Since January 2015 he has served as Vice President for Research and Corporate Relations at ETH Zurich.

Sarah Springman (1956) has been Full Professor of Geotechnical Engineering at ETH Zurich since January 1997, heading the institute from 2001 to 2005 and again from 2009 to 2011. She also served as joint deputy head of the Department of Civil, Environmental and Geomatic Engineering from 2013 to 2014. Since January 2015 she has been Rector of the University and acts as deputy to the ETH President.

Lino Guzzella (1957) was appointed Assistant Professor at ETH's Department of Mechanical and Process Engineering in 1993. Before that he worked in industry, as Sulzer's R&D team leader and as head of E&D mechatronics at Hilti. In 1999 he was appointed Full Professor for Thermatronics. From August 2012 to December 2014, Lino Guzzella was Rector of ETH Zurich, and he has been President of the University since January 2015.

Robert Perich (1961) who has a doctorate in Business Administration, has been Head of the Finance and Controlling division at ETH Zurich since 2003 and Vice President Finance and Controlling since October 2008. Before that, he worked for 11 years in the financial services industry, most recently as CFO and member of the Executive Board of the Private Banking Switzerland division of a leading Swiss bank.

Ulrich Weidmann (1963) has been Full Professor of Transport Systems at ETH Zurich since June 2004, and also served as Head of the Department of Civil, Environmental and Geomatic Engineering from 2013 to 2015. He became Vice President Human Resources and Infrastructure in January 2016. He had various senior management roles with the Swiss Federal Railways (SBB) from 1994 to 2004.

Remuneration

In 2016, the salaries of the five members of the Executive Board, including the employer's social security contributions, came to 2.09 million Swiss francs (last year: 2.08 million Swiss francs). The total sum includes 0.35 million Swiss francs (last year: 0.35 million Swiss francs) for pension benefits and 0.12 million Swiss francs for other social security contributions (last year: 0.11 million Swiss francs).

Secondary employment

Lino Guzzella: Member of the Board of Directors of Kistler Holding AG, shareholder of Robert Bosch Industrietreuhand KG (RBIK)
Sarah Springman: none
Detlef Günther: Member of the Board of Directors of GRS Gemresearch Swisslab AG
Robert Perich: none
Ulrich Weidmann: Member of the Board of Directors: Verkehrsbetriebe Glattal, Verkehrsbetriebe LIEmobil. Member of Technical Advisory Board: Alptransit. Arbitration Panel: Gotthard Base Tunnel (Rail Technology), Ceneri Base Tunnel (Rail Technology and Overall Coordination, Railtrack and Logistics). School Board Member: Mathematisch-Naturwissenschaftliches Gymnasium Rämibühl. Trustee of the Board: Fachstelle für behindertengerechtes Bauen.

Risk management

A systematic process

Risk management at ETH Zurich covers the entire institution, and takes account of both internal and external potential risks. ETH's risk management process takes its lead from ISO 31000, the internationally recognised risk management standard. Risks are continually identified, analysed, documented and monitored as part of a systematic process. This holistic approach also takes account of compliance, environmental and procurement risks. The goal of risk management at ETH Zurich is the safeguarding of tangible and intangible assets – assets which determine the success of the University. In particular, they include human capital, infrastructure and ETH's reputation.

Legal foundations and governance
In accordance with the autonomy granted to the six ETH Domain institutions under the Swiss ETH Act, which forms the bedrock of their work in the fields of teaching, research and service provision, each institution is itself responsible for the management of risk within its own sphere of operations, and each reports regularly to the ETH Board in its role as their supervisory body. The essential parameters of risk management and risk financing at ETH Zurich are laid down in the ETH Board's directive of 4 July 2006 on risk management at ETH and its research institutes.

As the officeholder with overall responsibility for risk management at ETH Zurich, the ETH President informs the ETH Board on an annual basis in relation to its core risks, in particular the scope and extent of those risks, their potential impacts on the institution, as well as any countermeasures already planned and implemented. The President also informs the ETH Board without delay of any exceptional changes to the risk profile or any instances of loss or damage.

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

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

Internal control system (ICS)
An important instrument in relation to risk management is an internal control system (ICS), which evaluates relevant financial processes and corresponding risks associated with bookkeeping and accounting, and minimises those 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. The Swiss Federal Audit Office verifies the existence of the ICS in the context of its statutory audit.

Core risks

Risks with potentially major impacts on finances or reputation are designated as core risks.

- ETH Zurich's highly educated lecturers, researchers, students and support staff (its **human capital**) are a key factor for its success. The risk that this human capital could be diminished through persistent and structural factors is therefore weighted correspondingly highly.

- A significant **loss of financial resources** due to a reduction in federal grants or a drop in third-party contributions would have immediate consequences for the quality and quantity of ETH's teaching and research, and therefore represents a correspondingly high level of risk.

- ETH Zurich is tasked with providing education at the highest level. A severe deterioration in the quality of teaching 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 successful scientific outcomes. Disregarding this principle can result in data manipulation, plagiarism, dereliction of duties of care, non-disclosure of conflicts of interest, and violations of, or non-adherence to, applicable ethical standards. This makes it impossible to guarantee the integrity of research findings. A working group charged with implementing the key principles of good scientific practice creates the necessary foundation for ensuring that research integrity at ETH Zurich is continuously adapted to accommodate the changing requirements associated with scientific progress.

- ETH Zurich's business processes are reliant on a fully functioning data network and secure data storage media. A **loss of data or a network failure** represents considerable risks to ETH's business processes, as does unauthorised access to its data. Measures implemented to achieve the protection targets defined as part of IT security are regularly reviewed by a panel of technical experts and adjusted as necessary.

- The Swiss Federal Act on Public Procurement and the associated Ordinance govern the principles of public **procurement.** A risk may emerge due to a compliance infringement in the procurement process. An effective procurement organisation ensures that federal procurement laws are adhered to and the goods and services purchased satisfy ETH Zurich's economic and environmental criteria.

- Rapid and open **communication** regarding the core tasks of research, teaching and technology transfer, as well as the management of ETH Zurich, serves to strengthen relations with stakeholders and promotes the reputation of ETH Zurich, both nationally and internationally. Failures of communication by ETH Zurich could lead to a loss of credibility and acceptance, incurring a loss of trust among key stakeholders. This would have corresponding financial and personnel impacts.

- **Violence or threats against the person** are the result of a complex interplay of factors operating on several levels. Violence is not limited to actual physical aggression, but also manifests itself in threats of violence, abuse of power and sexual harassment. Through preventive measures and constant reassessment of the current level of threat based on standardised instruments, the ETH Threat Management Team diffuses problems and conflicts at an early stage, before they escalate into violence.

- **Large-scale damage to the real estate used by ETH Zurich but owned by the Swiss Federation** entails the risk that the infrastructure necessary for research, teaching and the management of ETH Zurich may be unavailable for an extended period of time, resulting in the cancellation of important research and teaching activities in whole or in part. Measures to safeguard and increase the safety of buildings are an integral part of every newbuild or modernisation project, with the aim of averting major incidents.

Sustainability

Long-standing commitment to sustainable development

Sustainability has a long history at ETH Zurich. The University already played a pioneering role almost 30 years ago when it set up the Department of Environmental Sciences, demonstrating a clear commitment to environmental and sustainability research.

Even today, ETH Zurich is one of the few universities in Switzerland to have placed sustainability on the agenda at the highest decision-making level, making it a matter for the President. After all, one of ETH's strategic objectives is to cement and expand its reputation as an authoritative international centre of excellence for energy, environmental and sustainability research. In realising this objective, ETH Zurich can count on the support of various departments spanning a broad range of subject areas. In addition, several centres of excellence focus on research in fields relevant to sustainability, such as the environment and energy. ETH also ranks among the world's leading universities when it comes to the sustainability performance of its operations and infrastructure. On its Hönggerberg campus in particular, the University has carried out some pioneering renovation and newbuild work in recent years.

This long-standing commitment to sustainable development is also reflected in the relevant reporting. In 2002, ETH Zurich published its first annual energy report. Starting in 2005, this was expanded into a more extensive environmental report. Since the period 2009–2010, ETH Zurich has reported in detail on all three aspects of sustainability: the environmental, financial and social aspects of sustainable development. The latest Sustainability Report covers the period 2015–2016. It is the first to appear at the same time as ETH Zurich's Annual Report.

International standard
ETH Zurich has prepared all of its sustainability reports to date in accordance with the internationally recognised Global Reporting Initiative (GRI) standards and the International Sustainable Campus Network's ISCN/GULF Sustainable Campus Charter. ETH's sustainability reports are distinguished by including stakeholders in the reporting process, their local, national and global reach and their external certification.

Putting sustainability into action
ETH Zurich puts sustainable development into practice across its four core areas: research, teaching, campus, and dialogue and outreach. For each of these core areas, it has also defined an area of action geared towards sustainable development:

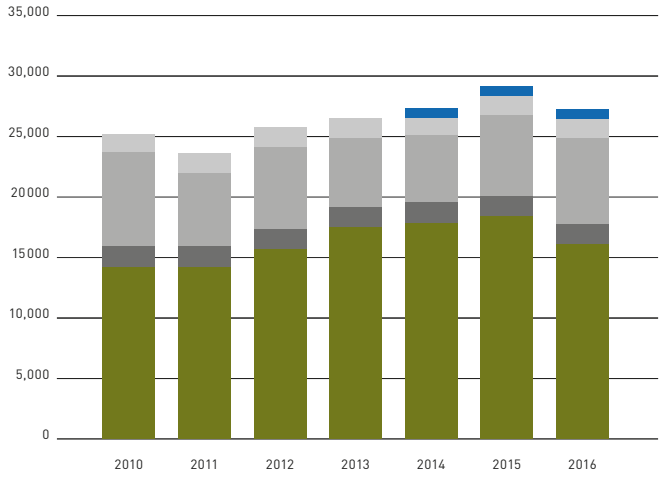
1. Through its research, ETH Zurich provides the technical and scientific expertise for society's sustainable development.
2. It educates future generations that will champion sustainable development.
3. It puts sustainability principles into practice on its campus.
4. It informs the public about the latest research findings.

Transparency and credibility
The Sustainability Report 2015–2016 covers each of the four areas of action and provides insights into developments, achievements and challenges. Highlights of the reporting period and over 50 objectives complete the picture.

ETH Zurich maintained its excellent track record in this reporting period. Nevertheless, the University also faces challenges. One key area is the ongoing rise in CO_2 emissions, primarily the result of business trips undertaken by members of ETH. This trend spotlights a conflict of objectives: while ETH Zurich wishes to reduce its carbon footprint, it relies on international networking when solving global challenges. In 2016 the Vice President Human Resources and Infrastructure commissioned a new mobility platform to explore this problem in detail and provide mobility management. Its mandate is to develop solutions to make campus mobility, business travel and ETH Zurich logistics more sustainable.

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

CO_2 emissions (in tonnes CO_2eq)



- Other (coolants and printing[1]; recorded since 2014)
- Purchased current
- Heat generation
- Commuter traffic (recorded since 2008)
- Business travel[2]

[1] Paper and energy consumption, procurement and maintenance of equipment.

[2] The figures for business travel were calculated using a more precise method and adjusted retrospectively (see Sustainability Report 2015/2016 for explanation).

Rented smaller premises and premises outside the canton of Zurich are not included in the multi-year comparisons. In the case of electricity and heat, emissions for all ETH properties (including outside the canton of Zurich) were included for the first time in 2015.

“The **high standard** of research at ETH is only possible thanks to third-party funding, as it requires not just highly qualified **professors**, but also the right **infrastructure**.”

Audrey Richard, doctoral student, Geomatic Engineering and Planning

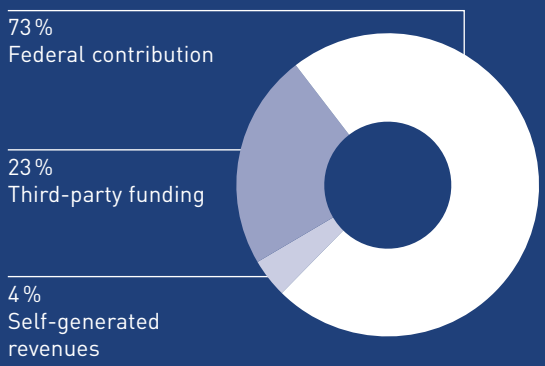
Finance

2016 brought another period of sustained growth for ETH Zurich. The number of students increased again, new professors were appointed and substantial investments were made, above all in the IT infrastructure. Operating expenses amounted to 1,642 million Swiss francs in total, a 2.4 percent increase on the previous year. Operating revenue climbed 3.3 percent to 1,768 million Swiss francs, with the 7.2 percent rise in revenue from third-party funding far outpacing the 1.9 percent growth in the federal contribution.

ETH Zurich places emphasis on a long-term, sustainable financial policy. This is based on a financial plan covering a period of several years and a long-term approach to balance sheet management. Selective diversification of its sources of funding also helps to keep the University on a sustainable track. The third-party funding that ETH attracts, enabling it to expand its research activities and implement planned investments and research projects more quickly, plays an increasingly important role in this context. In raising this funding, it is key for ETH Zurich to maintain its freedom in teaching and research as well as its strategic and financial scope. The federal financial contribution (global budget) provides a basis on which to do so.

For the second time, ETH Zurich's annual financial statements have been prepared in alignment with International Public Sector Accounting Standards (IPSASs) and clearly present the financial position, financial performance and cash flows on an accrual basis.

Financing 2016 (operating revenue)



Total: CHF 1,768 million

Current developments

The number of students increased by a further 3 percent to 19,815, and now the University is educating 52 percent more students than it was 10 years ago. The steady rise in student numbers requires ETH Zurich to make continual efforts to ensure the quality of teaching. As well as appointing new professors, increasing the number of senior scientists and senior assistants also plays a key role in maintaining an appropriate staff–student ratio.

These developments are also reflected in the key financial figures. Operating expenses amounted to 1,642 million Swiss francs in total, a 2.4 percent increase on the previous year. Operating revenue climbed to 1,768 million Swiss francs (up by 3.3 percent), with the 7.2 percent rise in revenue from third-party funding far outpacing the 1.9 percent growth in the federal contribution. Around three-quarters of the revenue comes from the federal contribution and one quarter from third-party funding.

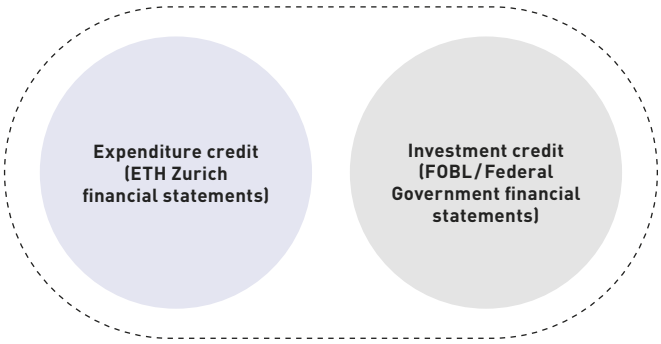
To keep the University on a sustainable track, it is extremely important for ETH Zurich to diversify its funding base. The successes chalked up in competitive project-oriented research funding and in grants to ETH Zurich mean that external financing (third-party funding) has increased by 183 percent since 2000, while the federal financial contribution has risen by 37 percent over the same period. By operating a rigorous quality policy and implementing relevant rules and procedures, ETH Zurich ensures that it manages third-party funding in a responsible and transparent manner.

Federal financial contribution (global budget), sources and use of funds

At a political level, the ETH Domain is managed through the performance mandate, the term and content of which are tailored to the Federal Government-approved funding. The ETH Board allocates the funds to ETH Zurich, EPFL and the four research institutions under the target agreements derived from the performance mandate.

The federal financial contribution granted to ETH Zurich (global budget) covers basic teaching and research equipment as well as its share of building investments for the Federal Government-owned property used by ETH Zurich.

Federal financial contribution (global budget)



Property owned by the Federal Government
With few exceptions, the property used by the ETH Domain is owned by the Federal Government. The ETH Domain and its institutions have been granted extensive powers of delegation and full management responsibility in the development and management of the property portfolio. In its capacity as a federal building and property service, the ETH Board coordinates the management of the real estate in accordance with the ETH Act and ensures that its value and functionality are maintained. ETH Zurich takes responsibility for the property (owned by the Federal Government or itself) that it manages and uses, and performs the related tasks.

Accounts showing the value of the property owned by the Federal Government and used by the ETH Domain are kept within the central Federal Administration at the Federal Office for Buildings and Logistics (FOBL).

The integral view shown in this section reflects the full delegation of responsibility. It compares the entire mandate performed by ETH Zurich, including property management, with the total federal financial contribution (global budget).

In 2016, the share of the total federal financial contribution (global budget) granted to ETH Zurich by the ETH Board amounted to 1,247 million Swiss francs. In the course of planning and budgeting, the share of the building shell (new buildings, renovations) is separated and recognised as an "investment credit" at the Federal Office for Buildings and Logistics (FOBL). The remainder is entered in ETH Zurich's financial statements as an "expenditure credit" or federal financial contribution (in the narrower sense). The table below shows the breakdown for the last two years:

Global budget (in CHF million)

	2016	2015	Absolute change
Federal financial contribution	**1,247**	**1,224**	**23**
Of which expenditure credit (ETH Zurich)	1,128	1,110	18
Of which investment credit (FOBL / Federal Government)	119	114	5

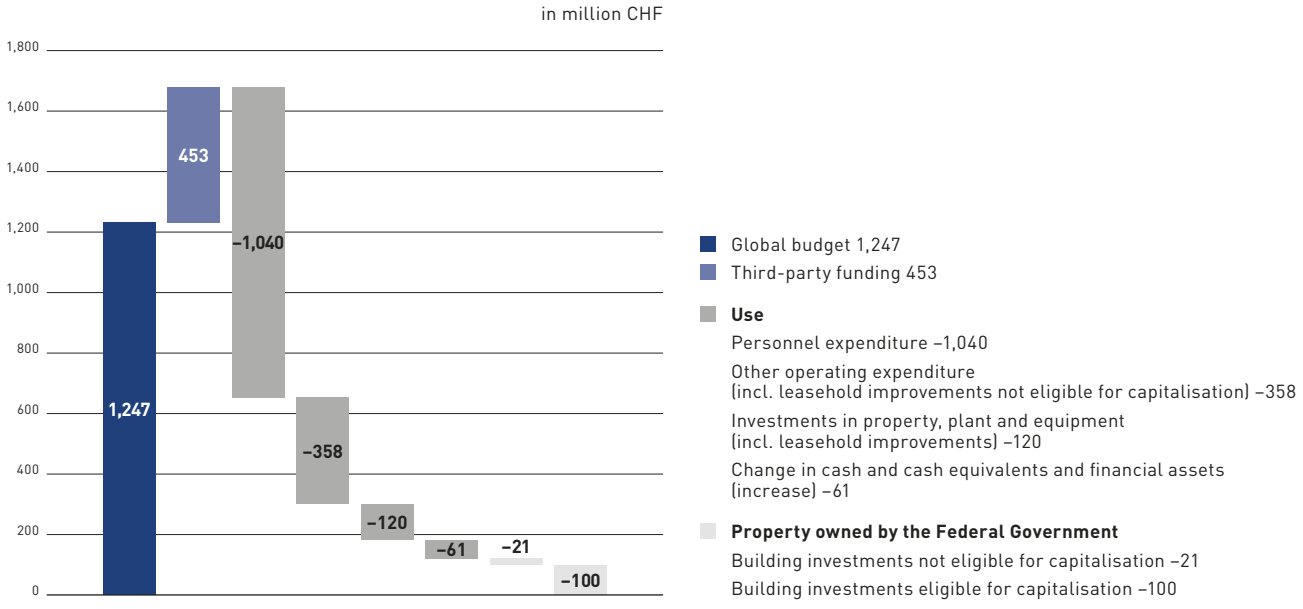
ETH Zurich received third-party funding amounting to 453 million Swiss francs in 2016, primarily from project-oriented research contributions, grants and self-generated revenues. ETH Zurich's total income amounted to 1,700 million Swiss francs.

The funds available are used, firstly, to cover personnel -expenditure in teaching, research and administration and, secondly, for construction spending, other operating expenditure and investments in movable assets. Third-party funding not used immediately in 2016 was added to financial assets.

In 2016, construction spending on properties amounted to a total of 179 million Swiss francs and was financed through the investment credit (119 million Swiss francs), the expenditure credit (57 million Swiss francs) and third-party funding (2 million Swiss francs).

The extensive and very mixed property portfolio managed by ETH Zurich mainly contains a 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 180 buildings and facilities and 70 plots of land. The carrying amount of the plots of land was 691 million Swiss francs at the end of 2016. The buildings were stated in the accounts at a value of 1,501 million Swiss francs at the end of 2016 and their replacement cost (gross cost) was estimated to be 3,530 million Swiss francs.

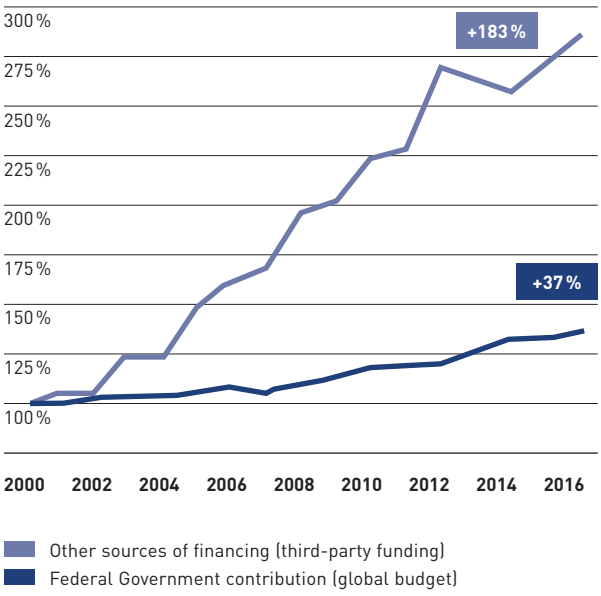
Composition and use of income (CHF 1,700 million)



Selective diversification makes for a sustainable funding base

The Federal Government is a reliable partner to the University, granting the federal financial contribution (global budget) that ensures ETH Zurich has a solid source of funding. However, a long-term analysis shows that the proportion of ETH Zurich's total funding provided by the Federal Government dropped from 85 percent in 2000 to 73 percent in 2016. This clearly illustrates the increasing importance of third-party funding. Given the growing international competition among universities conducting high-quality, technology-intensive research and the steady rise in student numbers, ETH Zurich faces both the necessity and increasing challenge of consciously diversifying its funding base.

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



On average over the last five years, just over two-thirds of all third-party funding has come from competitive research funding projects. These are financed by national or international research funding organisations (58 percent) such as the Swiss National Science Foundation (SNSF), the EU Framework Programmes (FP7, Horizon 2020), Swiss federal offices, the Commission for Technology and Innovation (CTI) or by private institutions and companies (11 percent).

Grants (donations, legacies / bequests) made up around 13 percent of third-party funding. They often enable ETH Zurich to implement strategic projects faster (e.g. setting up new professorships) and give new impetus to the focused development of research and teaching, including the necessary infrastructure. By far the largest share of the grants comes through the ETH Zurich Foundation, which acts as an intermediary between the donor and ETH Zurich.

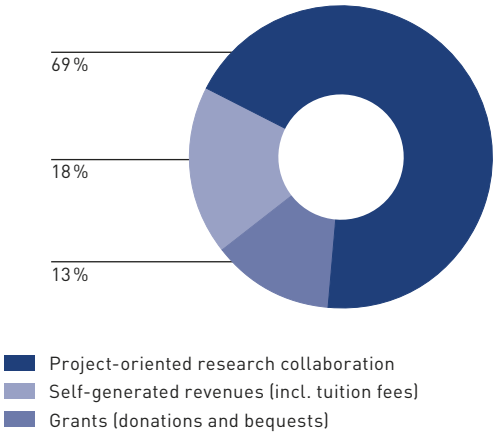
Finally, about 18 percent of the third-party funding was attributable to self-generated revenues. These comprise tuition fees (including various utilisation fees), various items of service revenue and other revenue.

It is vital for ETH Zurich to manage third-party funding responsibly and in conformity with its strategy. First and foremost, it needs to maintain its independence in teaching and research. Defined guidelines with clearly communicated principles ensure that it does so (ETH Zurich Code of Conduct for Scientific Cooperation, ETH Zurich Code of Conduct for Handling Donations or the ETH Zurich Foundation Code of Conduct).

On externally funded research projects, the general framework – that is, the strategy, quality, risks and indirect costs – must be closely examined. This includes any requirements on the part of foreign funding organisations, for example, and considering the additional costs ETH would incur for the project. Although an increasing number of funding organisations co-finance overhead costs, external funds are rarely enough to cover the costs in full. Infrastructure is often a tight resource.

A clearly defined and transparent funding diversification strategy is crucial to keeping ETH Zurich on a sustainable track. It is also essential that the Federal Government's global budget remains on a stable footing going forward.

ETH Zurich third-party funding (Ø 2012–2016)



Financial accounting and reporting in accordance with IPSASs

Since 1 January 2015, ETH Zurich's annual financial statements have been prepared in alignment with International Public Sector Accounting Standards (IPSASs). Income and expenditure have since been recognised in the period in which economic resources are created (revenue) or consumed (expenses) (accrual accounting), rather than solely at the date when ETH Zurich receives the funds (cash accounting).

For the current accounting period, there are still a few transitional provisions that apply in adopting IPSASs; please refer to the commentary on the annual financial statements for details (starting on p. 88). The aim is to fully implement all applicable IPSASs as of financial year 2017 and thus become one of the few universities worldwide to undergo a full IPSAS audit.

ETH Zurich's annual financial statements comprise the statement of financial performance, the balance sheet, the cash flow statement, the statement of changes in equity and the notes to the annual financial statements.

Annual financial statements in brief

A surplus of 131 million Swiss francs was reported for 2016 (an increase of 23 million Swiss francs or 21 percent compared with the previous year). The implementation of IPSASs has a significant impact on the presentation of the financial results. Firstly, revenue and expenses are recognised in the accounting period in which resources are generated or consumed. This means, for example, that revenue and expenses on multi-year projects are reported on the basis of the resources consumed, irrespective of the cash flow and almost without affecting surplus or deficit, while donations and other grants are usually recognised in surplus or deficit in full in the appropriate period once they become legally binding. Secondly, economic items are reflected that do not give rise to any direct cash flow, such as depreciation charges rather than actual investment expenditure or the effect on pension costs of attributing benefits on a straight-line basis under IPSAS 25.

The operating revenue generated in 2016 amounted to 1,768 million Swiss francs (up by 56 million Swiss francs or 3 percent compared with the previous year). The federal contribution, which under IPSASs is made up of the federal financial contribution (in the narrower sense) and the contribution to accommodation, climbed to 1,289 million Swiss francs (a rise of 24 million Swiss francs or 2 percent). As in the previous year, revenue from third-party funding showed above-average growth, with a rise in both revenue from donations and bequests, to 84 million Swiss francs (up by 22 million Swiss francs or 36 percent), and revenue from research contributions, to 324 million Swiss francs (up by 10 million Swiss francs or 3 percent).

Operating expenses rose to 1,642 million Swiss francs in 2016 (up by 38 million Swiss francs or 2 percent compared with the previous year). This rise was driven by an increase in both personnel and other operating expenses: salaries and wages rose by 11 million Swiss francs or 1 percent, mostly because of the rise in average full-time equivalents by 167 FTEs (2 percent) to 9,043 FTEs. Net pension costs increased primarily as a result of the first-time recognition of contributions to the pension fund for professors. Premises costs were up by 16 million Swiss francs and depreciation charges down by 11 million Swiss francs or 11 percent.

Total net assets rose by 115 million Swiss francs (5 percent) to 2,257 million Swiss francs at the end of 2016. Here, liabilities were up by 236 million Swiss francs, mainly because of the increase in net defined benefit liabilities. Equity, on the other hand, fell by 122 million Swiss francs to 159 million Swiss francs due to the negative trend in the valuation reserves (cumulative actuarial losses on the defined benefit liability), while dedicated reserves (earmarked for donations and bequests as well as election commitments to newly appointed professors, for example) rose by 64 million Swiss francs and free reserves by 12 million Swiss francs. Overall, this resulted in a substantial reduction in the equity ratio to 7 percent at the end of 2016 (previous year: 13 percent).

Details on the annual financial statements, including notes on individual items and explanatory notes on the accounting policies, can be found in the following sections starting on p. 82.

Annual 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.

Statement of financial performance

CHF million	Note	2016	2015
Federal financial contribution		1,128	1,110
Federal contribution to accommodation		161	155
Total federal contribution	1	1,289	1,265
Tuition fees and other utilisation fees	2	22	22
Swiss National Science Foundation (SNSF)		129	124
Commission for Technology and Innovation (CTI)		19	20
Special federal funding of applied research		40	25
EU Framework Programmes for Research and Innovation (FP)		57	60
Industry-oriented research (private sector)		49	52
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)		30	32
Research contributions, mandates and scientific services	3	324	314
Donations and bequests	4	84	62
Other revenue	5	48	48
Operating revenue		**1,768**	**1,712**
Personnel expenses	6	1,020	992
Other operating expenses	7	514	494
Depreciation	14, 17	89	100
Transfer expenses	8	20	19
Operating expenses		**1,642**	**1,605**
Operating result		**126**	**107**
Finance income	9	13	9
Finance expense	9	7	8
Finance result		**6**	**1**
Surplus (+) or deficit (–)		**131**	**109**

Balance sheet

CHF million	Note	31.12.2016	31.12.2015
Assets			
Cash and cash equivalents	10	142	132
Current receivables from non-exchange transactions	11	9	17
Current receivables from exchange transactions	11	12	12
Current financial assets	15	910	859
Inventories	12	7	7
Prepaid expenses and accrued income	13	22	21
Total current assets		**1,102**	**1,048**
Property, plant and equipment	14	440	407
Intangible assets	14	1	1
Non-current receivables from non-exchange transactions	11	658	632
Non-current receivables from exchange transactions	11	0	0
Investments held	16	0	0
Non-current financial assets	15	3	3
Co-financing	17	52	51
Total non-current assets		**1,154**	**1,094**
Total assets		**2,257**	**2,142**
Liabilities and equity			
Current liabilities	18	79	74
Current financial liabilities	19	0	0
Accrued expenses and deferred income	20	73	76
Short-term provisions	21	39	38
Short-term liabilities		191	189
Dedicated third-party funds	23	638	636
Non-current financial liabilities	19	17	17
Net defined benefit liabilities	22	1,218	987
Long-term provisions	21	34	32
Long-term liabilities		1,907	1,672
Total liabilities		**2,098**	**1,861**
Valuation reserves		– 816	– 563
Dedicated reserves		590	526
Free reserves		404	392
Co-financing of state-owned real estate		52	51
Accumulated surplus (+) / deficit (–)		– 71	– 126
Total equity		**159**	**281**
Total liabilities and equity		**2,257**	**2,142**

As of 2016, receivables from non-exchange transactions and receivables from exchange transactions will be presented separately in the balance sheet. Previously, they were only shown separately in the notes to the annual financial statements. The prior-year amounts for 2015 were adjusted accordingly for presentation in the balance sheet.

Statement of changes in equity

CHF million	Valuation reserves a	Dedicated donations and bequests	Teaching and research reserves b	Infrastructure and administration reserves c	Dedicated reserves	Free reserves d	Co-financing of state-owned real estate	Accumulated surplus (+)/deficit (–) e	Total equity
2016									
As of 1.1.2016	**– 563**	**332**	**153**	**41**	**526**	**392**	**51**	**– 126**	**281**
Surplus (+) or deficit (–)								**131**	**131**
Items directly recognised in equity									
Changes from defined benefit liability	– 254								**– 254**
Revaluation of financial assets	0								**0**
Hedging transactions	0								**0**
Total items directly recognised in equity	– 253								**– 253**
Reclassifications in equity	0	26	28	10	64	12	1	– 76	**0**
Total changes in equity	**– 253**	**26**	**28**	**10**	**64**	**12**	**1**	**55**	**– 122**
As of 31.12.2016	**– 816**	**358**	**180**	**51**	**590**	**404**	**52**	**– 71**	**159**
2015									
As of 1.1.2015	**– 237**	**314**	**152**	**20**	**486**	**354**	**47**	**– 153**	**498**
Surplus (+) or deficit (–)								109	**109**
Items directly recognised in equity									
Changes from defined benefit liability	– 328								**– 328**
Revaluation of financial assets	2								**2**
Hedging transactions	0								**0**
Total items directly recognised in equity	– 326								**– 326**
Reclassifications in equity	0	19	0	21	40	38	4	– 82	**0**
Total changes in equity	**– 326**	**19**	**0**	**21**	**40**	**38**	**4**	**27**	**– 217**
As of 31.12.2015	**– 563**	**332**	**153**	**41**	**526**	**392**	**51**	**– 126**	**281**

a The negative valuation reserves (CHF –816 million as of 31 December 2016) mainly comprise cumulative net actuarial and investment losses on the defined benefit liability (not recognised in surplus or deficit). The sharply negative trend in the reporting period was due, firstly, to the reduction in the discount rate and, secondly, to changes in demographic assumptions (dynamic rather than static method).

b Dedicated teaching and research reserves of CHF 180 million included election commitments to newly appointed professors of CHF 109 million as of 31 December 2016 (previous year: CHF 108 million). Dedicated teaching and research reserves now also include third-party commitments of CHF 26 million, mostly to finance two new professorships.

c The rise in dedicated infrastructure and administration reserves is attributable to the CHF 10 million increase in risk capital.

d Free reserves reflect funds freely available to ETH Zurich. These funds partly originate from completed research projects that show a surplus. Free reserves enable a flexible response to short-term declines in revenue or currency losses.

e The accumulated deficit is the residual of total equity less the reserve items presented separately. It shows the cumulative results at the reporting date and comprises the surplus/deficit carried forward, the surplus or deficit for the period and reclassifications in equity. Reclassifications in equity comprise the surplus or deficit realised in the reporting period and allocated to the reserves. The accumulated deficit of CHF 71 million as of 31 December 2016 resulted from the switch to the new accounting under IPSASs with effect from 1 January 2014 and partly reflects the effects of the initial recognition of the net defined benefit liability (CHF –485 million, see note 22, table entitled Historical data) arising from the shortfall in ETH Zurich's employee benefit plans with the collective institution PUBLICA (IPSAS 25).

Cash flow statement

CHF million	Note	2016	2015
Cash flows from operating activities			
Surplus (+) or deficit (–)		**131**	**109**
Depreciation	14, 17	89	100
Finance result (non-cash)		– 4	– 1
Increase/decrease in net working capital		8	– 4
Increase/decrease in net defined benefit liabilities	22	– 22	– 37
Increase/decrease in provisions	21	2	1
Increase/decrease in non-current receivables	11	– 25	– 9
Increase/decrease in dedicated third-party funds	23	2	– 11
Reclassification and other (non-cash) income		0	– 1
Cash flows from operating activities		**181**	**147**
Cash flows from investing activities			
Investments			
Purchase of property, plant and equipment	14	– 119	– 89
Purchase of intangible assets	14	0	– 1
Increase in co-financing	17	– 2	– 6
Increase in loans	15	0	0
Increase in investments held	16	0	0
Increase in current and non-current financial assets	15	– 65	– 95
Total investments		**– 187**	**– 191**
Divestments			
Disposal of property, plant and equipment	14	0	1
Disposal of intangible assets	14	0	0
Decrease in co-financing	17	0	0
Decrease in loans	15	0	0
Decrease in investments held	16	0	0
Decrease in current and non-current financial assets	15	16	29
Total divestments		**17**	**30**
Cash flows from investing activities		**– 171**	**– 160**
Cash flows from financing activities			
Increase in short-term and long-term financial liabilities	19	0	0
Decrease in short-term and long-term financial liabilities	19	0	0
Cash flows from financing activities		**0**	**0**
Total cash flow		**10**	**– 13**
Cash and cash equivalents at the beginning of the period (1.1.)	10	**132**	**145**
Total cash flow		10	– 13
Cash and cash equivalents at the end of the period (31.12.)	10	**142**	**132**
Contained in the cash flows from operating activities are:			
Dividends received		1	1
Interest received		1	1
Interest paid		– 1	0

Notes to the annual financial statements
General principles

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 more than 19,800 students from over 120 countries, including more than 4,000 doctoral students. It offers researchers an inspiring working environment and its students a comprehensive education. Twenty-one Nobel Laureates have studied, taught or conducted research at ETH Zurich, underlining the excellent reputation of the University.

Basis of accounting

These financial statements are single-entity financial statements covering the reporting period from 1 January 2016 to 31 December 2016. The reporting date is 31 December 2016.

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 5.2)

Accounting standards
Since 1 January 2015, the annual financial statements of ETH Zurich have been prepared in alignment 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).

Application of transitional provisions in new IPSASs
For the 2015 and 2016 accounting periods, there are transitional periods for the implementation of IPSASs in the following areas, which lead to deviations from IPSASs:

Deviation 1: IPSAS 6–8 (Consolidated and Separate Financial Statements, Investments in Associates, Interests in Joint Ventures) are not applied to investments held of over 20 percent. Instead, these are accounted for using a similar treatment to the former accounting method (based on the accounting manual for the ETH Domain).

Reason: Under IPSAS 6–8, the accounting must be assessed at institutions outside the core ETH Domain. This assessment is time-consuming and labour-intensive.

Deviation 2: Receivables from non-exchange transactions (IPSAS 23) are not fully divided into a current and non-current portion based on the contractual provisions.

Reason: Numerous contracts had to be assessed for the 2014 restatement. To check the contractual terms of payment would require a considerable amount of additional work. As the corresponding performance obligations are presented within non-current liabilities, the overall presentation of the balance sheet is not materially distorted.

Deviation 3: The provisions in the accounting manual for the ETH Domain governing provisions for holiday and overtime payments including long-service awards already earned are not fully implemented.

Reason: The accounting manual requires provisions for holiday and overtime payments to be calculated using the holiday and overtime balances actually recorded. These data are managed in a decentralised manner, and the changes to procedures and systems required to obtain the data are time-consuming. Estimates will continue to be used during the two-year transitional period.

Deviation 4: The provisions on financial instruments disclosures (IPSAS 30) are not fully implemented.

Reason: The implementation of IPSAS 30 requires extensive changes to processes and procedures. Implementing the requirements and retroactively obtaining the relevant data is time-consuming and labour-intensive.

Accounting policies

Deviation 5: The provisions of IPSAS 23.76 ff. on transfers of goods and services in-kind are not applied.

Reason: The complex issue must be assessed in detail at all institutions within the ETH Domain and requires changes to procedures, among other things. This assessment and the changes to procedures are time-consuming and labour-intensive.

Standards issued but not yet applied
The following IPSASs were issued before the reporting date. They only become effective later on and have not been applied, or early applied, in these annual financial statements.

IPSAS 33	First-time Adoption of Accrual Basis IPSASs
IPSAS 34	Separate Financial Statements
IPSAS 35	Consolidated Financial Statements
IPSAS 36	Investments in Associates and Joint Ventures
IPSAS 37	Joint Arrangements
IPSAS 38	Disclosure of Interests in Other Entities
IPSAS 39	Employee Benefits (will replace IPSAS 25)

All the above standards become effective on 1 January 2017, with the exception of IPSAS 39, which becomes effective on 1 January 2018. The effects of the standards on the annual financial statements are being systematically analysed and it is planned to implement them as of 1 January 2017.

The accounting policies are derived from the basis of accounting. The annual financial statements present a true and fair view of ETH Zurich's financial position, financial performance and cash flows, presenting revenue and expenses in the period in which they occur (accrual accounting).

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

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

Currency translation
The reporting is prepared in Swiss francs (CHF). All figures are shown in millions of Swiss francs (CHF million) unless indicated otherwise.

Foreign currency transactions are translated using the exchange rate at the transaction date, which is the date on which the transaction is initially recognised. At each reporting date, monetary items in foreign currencies are translated using the closing rate. The resulting currency translation differences are recognised as other finance income or finance expense. Non-monetary items are translated using the exchange rate at the transaction date.

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

In the case of an exchange transaction (IPSAS 9), the revenue is generally recognised when the goods are delivered or the services rendered. For project agreements, the service obligation not yet performed is allocated to liabilities. The revenue is billed and reported by reference to the stage of completion of the project, based on the costs incurred in the reporting period. In the case of a non-exchange transaction (IPSAS 23), a distinction is made between whether or not there is a performance or repayment obligation. If there is such an obligation, the corresponding amount is recognised as a liability at inception of the agreement and released to surplus or deficit according to the stage of completion. 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 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 and other utilisation fees
Revenue from tuition fees and other utilisation fees is classified as an exchange transaction (IPSAS 9). As a rule, revenue is recognised when the goods are delivered or the services rendered. If services performed beyond the reporting date are material, they are accounted for on an accrual basis.

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. How revenue is recognised depends on whether there is a performance or repayment obligation. Revenue from non-exchange transactions (IPSAS 23) is recognised when a receivable is legally binding, an inflow of resources is probable and there is no further performance obligation. Usually, a performance obligation exists and revenue is reported according to the stage of completion of the project in the accounting period based on the resources consumed.

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

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 recognised when the goods are delivered or the services rendered. If services are performed beyond the reporting date, they are accounted for on an accrual basis.

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 a term of up to 90 days. 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 from 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 actual amount 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 from exchange transactions are stated at cost when the revenue is realised.

Global value adjustments are usually recognised on receivables based on their age structure. In rare cases, specific value adjustments are also recognised if there are concrete indications that a default will occur.

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 [1]
Buildings and structures	according to components [2]
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] In the case of items of property, plant and equipment with a value of CHF 1 million or above, 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).

[2] Useful life depends on the type of building, its purpose and the fabric of the building (20 –100 years). Assets under construction are not yet 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 which increase the economic benefits of an item of property, plant and equipment or extend its useful life are recognised in the carrying amount and depreciated over the estimated useful life. Pure repair and maintenance costs are recognised as an expense. Borrowing costs for assets under construction are capitalised.

The residual value of property, plant and equipment that is retired 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 (e.g. teaching collections, art or historical collections, libraries) 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, with the amortisation charges recognised in surplus or deficit. 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 asset and liability 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.

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

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.

Financial assets with a fixed maturity which the entity has the intention and ability to hold to maturity are stated at amortised cost using the effective interest method. 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.

Other financial assets that are held for an undefined 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. 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.

Originated loans are stated either at amortised cost (loans of less than CHF 10 million) or at amortised cost using the effective interest method (loans of over CHF 10 million).

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. One exception are derivative financial instruments designated as cash flow hedges, for which changes in value are recognised in equity.

ETH Zurich does not own any investment property.

Investments held
Under the transitional provisions, investments held are measured and disclosed in a similar way to the former accounting method (see page 88). As a rule, they are measured at cost less any value adjustments.

Co-financing of state-owned real estate
Co-financing is third-party funding acquired by ETH Zurich that is used for construction projects in property owned by the Federal Government. Co-financing is measured based on the measurement of the underlying property, which the Federal Government recognises at cost less accumulated depreciation. A property's ongoing depreciation therefore reduces the value of the co-financing to the same degree. 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 are monetary liabilities resulting from financing activities. They are usually interest-bearing. Liabilities that are due for repayment within twelve months of the reporting date are current. They are measured at amortised cost.

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
ETH Zurich's net defined benefit liabilities comprise the obligations relating to ETH Zurich from employee benefit plans within the employee benefit scheme the ETH Domain maintains at the collective institution PUBLICA, which provide retirement, death and disability benefits. Net defined benefit liabilities correspond to the defined benefit obligations calculated in accordance with the methods under IPSAS 25 less the fair value of the pension fund assets (if necessary, adjusted for a surplus in accordance with paragraph 69(b) or past service cost).

The defined benefit obligation (DBO) is calculated by external actuarial experts using the projected unit credit (PUC) method. The DBO corresponds to the present value of the benefits earned up to the valuation date. Service cost is equal to the benefits under the applicable terms that will be earned in the following year. The calculation is made based on information about the beneficiaries (salary, vested benefits, etc.) and using actuarial assumptions, which include both demographic assumptions (retirement rates, disability rates, mortality rates, etc.) and financial assumptions (salary trends, pension trends, returns, etc.). The amounts calculated are discounted to the valuation date by applying the discount rate. Changes in estimates of economic conditions can affect defined benefit obligations.

Under the PUC method, benefit entitlements are added evenly over the number of years of service to be rendered, rather than reflecting the actual distribution of retirement credits under the ETH Domain's employee benefit scheme, where they are graduated and increase with age. The defined benefit obligation was measured based on the current membership base of the ETH Domain's employee benefit scheme as of 31 October 2016, using actuarial assumptions as of 31 December 2016 (e.g. BVG 2015 actuarial tables) and the plan provisions of the ETH Domain's employee benefit scheme. The results were then adjusted using estimated pro-rata cash flows as of 31 December 2016.

The effects of plan amendments (past service cost) are recognised immediately in surplus or deficit in the period in which they occur provided they result in vested benefits. Any additional effects are recognised in equity by attributing them evenly over the expected average remaining working life until employees are entitled to the benefits. Actuarial and investment gains and losses on defined benefit plans are recognised directly in equity in the reporting period in which they occur.

Material other long-term employee benefits (e.g. future long-service awards) are also measured using the PUC method.

Dedicated third-party funds
Liabilities arising from dedicated projects where revenue is classified as a non-exchange transaction (IPSAS 23) are presented in the balance sheet as dedicated third-party funds within non-current liabilities; non-current because the projects usually last for several years and the current portion of the liability cannot be determined. 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
The following are recognised in the valuation reserves without affecting surplus or deficit:

- Revaluation reserves for available-for-sale financial assets. Fair value changes are recognised in equity until the financial assets are sold.

- Valuation reserves from defined benefit obligations: Actuarial and investment gains and losses on defined benefit obligations or plan assets are recognised in equity.

- Valuation reserves from hedging transactions: If hedge accounting is used, positive and negative replacement values from hedging transactions are recognised in equity and released to surplus or deficit when the hedged transaction affects surplus or deficit.

Dedicated reserves
Dedicated reserves in equity include the following items:

- Donations and bequests: This item includes unused funds from donations and bequests that have certain conditions attached, but do not qualify as liabilities.

- Teaching and research reserves: This item indicates that various internal and external commitments exist and appropriate reserves have had to be recognised to cover them. These mostly comprise "election commitments", i.e. funds granted to newly elected professors under contractual arrangements to enable them to set up their professorship. These reserves are recognised when commitments have been made in writing and an employment contract is in place. These contributions to appointees are usually used over a period of three to five years.

- Infrastructure and administration reserves: These include reserves for fluctuations in the value of the securities portfolio (risk capital).

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

Free reserves
Free reserves comprise:

- Free reserves of the Executive Board: There are no external or internal conditions which would restrict the freedom to decide on their use.

- Free research reserves of the departments/professors: These primarily result from balances remaining on completed third-party funded projects. They are used for teaching and research and to cover losses (e.g. from foreign currency fluctuations). They are not restricted in terms of time or purpose, however.

There are no free reserves from the federal financial contribution.

Co-financing of state-owned real estate
Co-financing is third-party funding acquired by ETH Zurich that is used for construction projects in property owned by the Federal Government. These funds transferred to the Federal Government are presented as co-financing within non-current assets and the third-party funds recognised as revenue in surplus or deficit are presented as dedicated equity under the heading Co-financing.

Accumulated surplus/deficit
The accumulated surplus or deficit shows the cumulative results at the reporting date. It comprises the surplus/deficit carried forward, the surplus/deficit for the period and reclassifications in equity.

The surplus/deficit carried forward is accumulated annually as part of the appropriation of surplus/deficit. The surplus/deficit for the period includes the portion of the result not yet distributed.

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 defined as 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. This only includes contingent assets receivable from third parties.

Financial commitments

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

Cash flow statement

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

Estimation uncertainty and management judgements

Estimation uncertainty in the application of accounting policies

Preparation of the annual financial statements in accordance with generally accepted accounting principles requires the use of estimates and assumptions. Estimates and assumptions are based on past experience and other factors that are reasonable and justified, such as expectations regarding the occurrence of future events. Additionally, when applying the accounting policies, decisions have to be made that may have a significant effect on the amounts reported in the annual financial statements. Although these estimates are based on management's best knowledge, actual results may differ from those estimates. This applies to the following items in particular:

- Useful life and impairment of property, plant and equipment: The useful life of property, plant and equipment is defined and periodically reviewed bearing in mind the current technical environment and past experience. A change in the estimate may affect the future amount of the depreciation charges and the carrying amount.
  Estimates that could lead to a reduction in the carrying amount (impairment) are likewise made in the course of the regular impairment test.

- Provisions: These involve a higher degree of estimation than other balance sheet items 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 liability is calculated based on long-term actuarial assumptions for the defined benefit liability and for the expected return on plan assets. The discount rate and future salary trends are key components in the actuarial valuation. These assumptions may differ from actual future developments.

- Recognition of donations: ETH Zurich regularly receives donations in the form of assets. Under IPSASs, these 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 and liabilities as well as provisions. They are based on a risk-free rate and a premium for credit risk.

Management judgements in the application of accounting policies

The agreement with Immobilien ETHZF AG (a subsidiary of the ETH Zurich Foundation) regarding the use of a building on the Hönggerberg campus was classified as a finance lease in financial year 2015, in particular as the agreement transfers substantially all the risks and rewards incidental to ownership to ETH Zurich and the term of the lease covers most of the useful life of the building.

Notes

1 Total federal contribution

The total federal contribution makes up around three quarters of the operating revenue. It includes the expenditure credit or federal financial contribution (in the narrower sense), which is used to cover basic teaching and research equipment, but not the investment credit, which is stated in the federal financial statements (see Accounting policies, page 90). Instead, the total federal contribution includes the federal contribution to accommodation, which is used to cover rent charged by the Federal Government for the use of the buildings it owns. The related accommodation expense is a component of other operating expenses. Leasehold improvements and the buildings' operation and maintenance are not part of the contribution to accommodation; rather, they are financed out of the federal financial contribution (in the narrower sense).

In 2016, the financial contribution increased by CHF 18 million, or 1.6 percent, to CHF 1,128 million. The contribution to accommodation rose by CHF 6 million to CHF 161 million due primarily to the increase in the proportion of buildings used by ETH Zurich. The latter is offset to an equal degree by the accommodation expense for the use of property owned by the Federal Government (see note 7).

2 Tuition fees and other utilisation fees

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

Revenue from tuition fees and utilisation fees was unchanged year on year at CHF 22 million.

3 Research contributions, mandates and scientific services

CHF million	2016	of which revenues (IPSAS 23)	of which revenues (IPSAS 9)	2015	Change absolute
Swiss National Science Foundation (SNSF)	129	129	0	124	5
Commission for Technology and Innovation (CTI)	19	19	0	20	– 1
Special federal funding of applied research	40	29	11	25	15
EU Framework Programmes for Research and Innovation (FP)	57	57	0	60	– 4
Industry-oriented research (private sector)	49	19	29	52	– 4
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)	30	21	9	32	– 1
Total research contributions, mandates and scientific services	**324**	**275**	**50**	**314**	**10**

Revenue from research contributions, mandates and scientific services is mostly recognised according to the stage of completion of the project in the accounting period based on the resources consumed. Revenue is therefore impacted significantly by both the composition of the underlying project portfolio and the phase the projects are in. For projects in the initial phase, for example, which generate comparatively little expense, a small amount of revenue is usually recognised. Following this initial phase, the expenses usually increase, leading to the recognition of a correspondingly higher amount of revenue.

Federal research mandates showed a rise in revenue (CHF +15 million). This was attributable in particular to the financing for two new professorships, which was recognised in surplus or deficit in the full amount of CHF 18 million in 2016. SNSF projects also increased (CHF +5 million). This increase was partly attributable to the stage of completion of projects under the National Centres of Competence in Research (NCCRs).

Revenue from industry-oriented research declined due to the lower project volume (CHF –4 million). Revenue from EU Framework Programmes for Research and Innovation was also down (CHF –4 million). This decline in revenue was related, firstly, to the move from the seventh EU Framework Programme (FP7) to the eighth EU Framework Programme (Horizon 2020), as a result of which many projects were in the initial phase and still reporting little revenue. Secondly, the uncertainty surrounding Switzerland's "partial association" arrangement and its temporary exclusion from some programmes led to a decline in projects. Of the EU research contributions reported in the amount of CHF 57 million, CHF 11 million comprise federal contributions granted directly from federal funds as part of the bridge financing (Horizon 2020) (previous year: CHF 4 million).

Revenue from CTI projects fell by CHF 1 million, as the project portfolio contained more and more new projects in the initial phase.

Information on non-current receivables, changes in those receivables and dedicated third-party funds related to projects financed through the third-party funding category in question can be found in notes 11 and 23.

4 Donations and bequests

This item combines all types of grant (e.g. donations, bequests, bequeathments by will). These donations and bequests enable ETH Zurich to implement strategic projects faster and give new impetus to the focused development of research and teaching, including the necessary infrastructure.

Revenue from donations and bequests increased by CHF 22 million year on year to CHF 84 million, as several large donation agreements were signed in 2016 and mostly recognised in surplus or deficit in full in the year of signing.

5 Other revenue

CHF million	2016	2015	Change absolute
Revenue from licences and patents	2	2	0
Sales	7	7	0
Refunds	5	5	0
Other services	18	18	0
Real estate revenue	8	8	0
Profit from disposals	0	0	0
Other miscellaneous revenue	7	8	– 1
Total other revenue	**48**	**48**	**0**

6 Personnel expenses

CHF million	2016	2015	Change absolute
Professors	123	122	1
Scientific personnel	449	447	2
Technical and administrative personnel, apprentices, trainees	304	296	8
IC, SUVA and other refunds	– 12	– 12	1
Total salaries and wages	**864**	**853**	**11**
Social insurances OASI/DI/IC/MB	55	54	1
Net pension costs	80	58	22
Accident and sickness insurance SUVA (BU/NBU/KTG)	3	3	0
Employer's contribution to Family Compensation Fund (FAK/FamZG)	10	10	0
Total social insurance schemes and pension expenses	**147**	**124**	**23**
Other employer contributions	1	8	– 7
Temporary personnel	0	0	0
Change in provisions for untaken leave and overtime	0	– 1	1
Change in provisions for contributions to long-service awards	2	2	0
Other personnel expenses	5	6	– 1
Total personnel expenses	**1,020**	**992**	**28**

Salaries and wages increased by 1.3 percent year on year. This was related primarily to the rise in average full-time equivalents by 167 FTEs to 9,043 FTEs (+1.9 percent). Details on the changes in personnel can be found in the section entitled Human resources and infrastructure (starting on page 54).

The rise in the item Social insurance schemes and pension expenses was largely attributable to the change in net pension costs. These represent the net defined benefit liability accrued and allocated on a straight-line basis over the years of service. They increased year on year due in particular to the first-time recognition of contributions to the pension fund for professors. As of 2016, the related expense will be reclassified out of other employer contributions and into net pension costs. This alone reduced other employer contributions and increased net pension costs by CHF 6 million year on year.

7 Other operating expenses

CHF million	2016	2015	Change absolute
Expenses for goods and materials	61	63	– 2
Premises costs	244	227	16
Other operating costs	209	203	5
Total other operating expenses	**514**	**494**	**20**

Premises costs increased year on year (CHF +16 million). In particular, they comprise the accommodation expense for the use of property owned by the Federal Government, which at CHF 161 million represents the largest item within premises costs (CHF +6 million; see note 1). Expenses for leasehold improvements (structural adjustments to buildings in line with ETH Zurich's requirements), maintenance, upkeep and refurbishment of technical equipment, and leased premises not owned by the Federal Government also increased.

Other operating costs rose due to a loss on receivables of CHF 8 million in connection with a donor's withdrawal from a donation agreement dating back to 2012. Despite higher consumption, energy expenses declined year on year (CHF –2 million) due to the trend in energy prices.

8 Transfer expenses

CHF million	2016	2015	Change absolute
Scholarships and grants to students and doctoral students	13	12	1
Contributions to research projects	2	2	– 1
Other transfer expenses	5	5	0
Total transfer expenses	**20**	**19**	**1**

9 Finance income and finance expense

CHF million	2016	2015	Change absolute
Finance income			
Interest income	3	2	1
Income from investments	1	1	0
Changes in fair value of financial assets	6	2	5
Other finance income incl. currency translation differences	2	4	– 2
Total finance income	**13**	**9**	**4**
Finance expense			
Interest expense	1	0	1
Financing costs (without interest expense)	0	0	0
Changes in fair value and impairment of financial assets	4	3	1
Other finance expense incl. currency translation differences	2	5	– 3
Total finance expense	**7**	**8**	**– 1**

Finance income increased year on year, due especially to the performance of the asset management mandates (see also note 15). Interest income consisted mostly of the unwinding of the discount on non-current receivables (CHF 1.8 million).

Finance expense declined year on year due primarily to lower foreign exchange losses. Conversely, interest expense increased, reflecting the full-year effect of the finance lease (previous year: four months). Further information on the finance lease can be found in note 19.

10 Cash and cash equivalents

CHF million	31.12.2016	31.12.2015	Change absolute
Cash	1	1	0
Swiss Post	57	54	3
Bank	9	7	2
Short-term deposits (<90 days)	75	70	5
Total cash and cash equivalents	**142**	**132**	**10**

The change in cash and cash equivalents is closely related to ETH Zurich's investing and financing activities (see cash flow statement, page 87). A significant portion of the cash and cash equivalents comprises deposits with the Federal Government (short-term deposits with a term of up to 90 days). These are funds collected from third parties that will not be used immediately and are placed with the Federal Government in accordance with the investment guidelines stipulated by the ETH Board.

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

11 Receivables

CHF million	31.12.2016	31.12.2015	Change absolute
Receivables from project contracts and donations	666	641	25
Other receivables	2	8	– 6
Value adjustments	0	0	0
Receivables from non-exchange transactions	**667**	**649**	**19**
thereof current	9	17	– 8
thereof non-current	658	632	27
Trade accounts receivable	12	11	1
Other receivables	0	2	– 1
Value adjustments	0	0	0
Receivables from exchange transactions	**12**	**12**	**0**
thereof current	12	12	0
thereof non-current	0	0	0

Non-current receivables 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 non-current receivables.

Non-current receivables from non-exchange transactions rose in the case of applied research, donations, and CTI and EU projects, while receivables from other third-party funding and SNSF projects declined. Receivables from donations included a reduction of CHF 8 million due to a donor's withdrawal from a donation agreement dating back to 2012 (see note 7).

Current receivables decreased (CHF –8 million) due primarily to an advance payment to social insurance institutions in the previous year that did not recur in financial year 2016.

12 Inventories

Inventories comprise purchased inventories (there are no self-produced inventories). Among other items, they include recurring inventories such as chemicals, laboratory materials and materials used for experiments in teaching and research.

Inventories were unchanged year on year at CHF 7 million.

13 Prepaid expenses and accrued income

CHF million	31.12.2016	31.12.2015	Change absolute
Interest	0	0	0
Other prepaid expenses and accrued income	21	21	1
Total prepaid expenses and accrued income	**22**	**21**	**1**

The largest items in 2016 were the library's media purchases, advance rental payments and advance payments for hardware and software maintenance agreements.

14 Property, plant and equipment and intangible assets

CHF million	Machinery, equipment, furnishings, vehicles	IT hardware	Other movable assets [1]	**Total movable assets**	Property, buildings	Assets under construction	**Total immovable assets**	**Total property, plant and equipment**	**Total intangible assets [2]**
2016									
Purchase value									
As of 1.1.2016	**765**	**172**	**13**	**950**	**190**	**90**	**280**	**1,231**	**7**
Additions	41	56	4	101	2	17	19	**120**	**0**
Reclassifications	4	1	– 5	0	4	– 4	0	**0**	**0**
Disposals	– 9	– 8	0	– 17	0	0	0	**– 17**	**0**
As of 31.12.2016	**802**	**220**	**12**	**1,034**	**196**	**103**	**299**	**1,333**	**7**
Accumulated depreciation									
As of 1.1.2016	**634**	**141**	**0**	**775**	**49**	**0**	**49**	**823**	**5**
Depreciation	52	19	0	72	15	0	15	**87**	**1**
Impairments	0	0	0	0	0	0	0	**0**	**0**
Reversed impairments	0	0	0	0	0	0	0	**0**	**0**
Reclassifications	0	0	0	0	0	0	0	**0**	**0**
Disposals value adjustments	– 9	– 8	0	– 17	0	0	0	**– 17**	**0**
As of 31.12.2016	**677**	**153**	**0**	**830**	**64**	**0**	**64**	**893**	**6**
Balance sheet value as of 31.12.2016	**125**	**67**	**12**	**204**	**132**	**103**	**235**	**440**	**1**
thereof leased assets					16		16	16	
2015									
Purchase value									
As of 1.1.2015	**745**	**204**	**11**	**960**	**155**	**93**	**248**	**1,207**	**7**
Additions	52	16	5	73	20	13	33	**106**	**1**
Reclassifications	2	0	– 2	0	16	– 16	0	**0**	**0**
Disposals	– 34	– 49	0	– 83	0	0	0	**– 83**	**– 1**
As of 31.12.2015	**765**	**172**	**13**	**950**	**190**	**90**	**280**	**1,231**	**7**
Accumulated depreciation									
As of 1.1.2015	**615**	**159**	**0**	**774**	**34**	**0**	**34**	**808**	**6**
Depreciation	52	31	0	83	15	0	15	**98**	**0**
Impairments	0	0	0	0	0	0	0	**0**	**0**
Reversed impairments	0	0	0	0	0	0	0	**0**	**0**
Reclassifications	0	0	0	0	0	0	0	**0**	**0**
Disposals value adjustments	– 33	– 49	0	– 82	0	0	0	**– 82**	**– 1**
As of 31.12.2015	**634**	**141**	**0**	**775**	**49**	**0**	**49**	**823**	**5**
Balance sheet value as of 31.12.2015	**132**	**31**	**13**	**175**	**142**	**90**	**232**	**407**	**1**
thereof leased assets					17		17	17	

[1] Other movable assets include advance payments and movable assets under construction.

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

Property, plant and equipment can generally be divided into movable and immovable assets. Movable items of property, plant and equipment consist largely of technical/scientific equipment as well as information and communications technology (ICT) equipment, furnishings and vehicles.

ETH Zurich's immovable property, plant and equipment consists of four properties owned by ETH Zurich (CHF 16 million), one property under a finance lease (CHF 16 million) and leasehold improvements (CHF 100 million excluding assets under construction). The latter are user-specific structural adjustments to buildings taken by ETH Zurich. The majority of these properties are owned by the Federal Government and are reported in the balance sheet of the Federal Government rather than that of ETH Zurich.

15 Financial assets

CHF million	31.12.2016	31.12.2015	Change absolute
Securities, discounted papers and fixed deposits	151	117	34
Positive replacement values	0	0	0
Loans	0	0	0
Other financial assets	759	742	17
Total current financial assets	**910**	**859**	**52**
Securities, discounted papers and fixed deposits	0	0	0
Loans	0	0	0
Other financial assets	3	2	1
Total non-current financial assets	**3**	**3**	**0**

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

The increases in 2016 in funds deposited with the Federal Government led to a rise in other current financial assets. The financial assets invested with the Federal Government with a term of three to twelve months amounted to CHF 732 million at the end of 2016 (previous year: CHF 720 million).

The asset management mandates were increased in volume in 2016. This and the positive performance of the asset management mandates are reflected, firstly, in securities, discounted papers and fixed deposits (CHF +34 million); secondly, other current financial assets also rose.

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

16 Investments held

CHF	31.12.2016	Acquisition value	Value adjustments	Interest (in %)	31.12.2015	Change absolute
ETH Zürich SEC AG [1]	100,000	100,000	0	100.0	100,000	0
ETH Store AG [1]	100,000	250,000	– 150,000	50.0	100,000	0
Inspire AG [1]	34,000	34,100	– 100	34.1	34,000	0
Business Tools AG [1]	16,700	16,700	0	33.4	16,700	0
GE Inspection Robotics Ltd [1]	24,000	24,000	0	24.0	24,000	0
Total investments held	**274,700**				**274,700**	**0**

[1] Based in Zurich.

The increase in the investment in ETH Store AG was adjusted in value in the course of the same year.

17 Co-financing

CHF million	2016	2015	Change absolute
Purchase value			
As of 1.1.	**60**	**54**	6
Additions	2	6	– 3
Disposals	0	0	0
As of 31.12.	**62**	**60**	**2**
Accumulated depreciation			
As of 1.1.	**9**	**7**	**2**
Depreciation	2	2	0
Disposals	0	0	0
As of 31.12.	**10**	**9**	**2**
Balance sheet value as of 31.12.	**52**	**51**	**1**

Co-financing increased year on year, as some of ETH Zurich's third-party funds were used for a construction project for a property owned by the Federal Government on the Hönggerberg campus.

18 Current liabilities

CHF million	31.12.2016	31.12.2015	Change absolute
Trade payables	19	19	0
Liabilities to social insurance institutions	13	13	0
Other current liabilities	47	43	5
Total current liabilities	**79**	**74**	**4**

Other current liabilities increased mainly as a result of the change in the balance on settlement accounts related to project collaborations.

19 Financial liabilities

Current and non-current financial liabilities

As in the previous year, the non-current financial liabilities of CHF 17 million were solely attributable to liabilities arising from the finance lease.

Current financial liabilities were small in amount and unchanged year on year at the end of 2016.

Finance lease disclosures

CHF million	Future minimum leasing payments 2016	Future financial expenses 2016	Present value of future minimum leasing payments 2016
Due dates			
Due within 1 year	1	1	0
Due within 1 to 5 years	6	5	1
Due after more than 5 years	31	15	16
Total as of 31.12.	**38**	**21**	**17**

	2016
Leasing expenses	
Lease payments expensed in period	0
Additional details	
Future revenue from sublease (from non-cancellable contracts)	0

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

20 Accrued expenses and deferred income

CHF million	31.12.2016	31.12.2015	Change absolute
Interest	0	0	0
Other accrued expenses and deferred income	73	76	–3
Total accrued expenses and deferred income	**73**	**76**	**–3**

The largest items in 2016 were deferred revenues from exchange transactions (IPSAS 9) (CHF 49 million) and accrued expenses for construction projects and operation.

21 Provisions

CHF million	Provisions for untaken leave and overtime	Other long-term employee benefits (IPSAS 25)	**Total provisions**
2016			
As of 1.1.2016	38	32	**70**
Creation (incl. increase)	0	2	2
Reversal	0	0	0
Appropriation	0	0	0
Increase in present value	0	0	0
As of 31.12.2016	**39**	**34**	**72**
of which short-term	39		39
of which long-term		34	34
2015			
As of 1.1.2015	39	30	**70**
Creation (incl. increase)	0	2	2
Reversal	– 1	0	– 1
Appropriation	0	0	0
Increase in present value	0	0	0
As of 31.12.2015	**38**	**32**	**70**
of which short-term	38		38
of which long-term		32	32

Current provisions consist of provisions for untaken leave and overtime. Non-current provisions relate to future long-service awards.

There were no provisions for dismantling, litigation, guarantees or warranties in the reporting period or in the previous year.

22 Net defined benefit liabilities

Within the ETH Domain's employee benefit scheme at the PUBLICA collective foundation, there are three employee benefit plans for employees and one employee benefit plan for professors. Employees are allocated to an employee benefit plan based on their salary band. In accordance with IPSAS 25, these plans are classified as defined benefit plans.

Net defined benefit liabilities

CHF million	**31.12.2016**	**31.12.2015**	**Change absolute**
Present value of defined benefit obligation from funded plans	– 4,338	– 3,984	– 354
Fair value of plan assets	3,134	2,997	137
Surplus (+)/deficit (–)	**– 1,204**	**– 987**	**– 216**
Present value of defined benefit obligation from unfunded plans	– 15	0	– 15
Net defined benefit liabilities	**– 1,218**	**– 987**	**– 231**

Net defined benefit liabilities rose due to the increase in defined benefit obligations attributable to the changes in demographic assumptions and the reduction in the discount rate (0.2 percent versus 0.4 percent in the previous year). This effect was lessened by the increase in plan assets.

The present value of the unfunded defined benefit obligations as at the end of 2016 included the first-time recognition of contributions made to the pension fund for professors.

Pension costs

CHF million	2016	2015	Change absolute
Current service cost (employer)	133	120	13
Interest expense	16	29	– 13
Expected return on plan assets	– 82	– 91	9
Immediate recognition of net gains from other long-term employee benefits	0	0	0
Past service cost	15	0	15
Pension costs	**82**	**58**	**24**

The employer contributions are set out in the applicable terms, with savings contributions graduated according to and rising with age. In accordance with the methods of calculation under IPSAS 25, service cost is measured so that the funding of the defined benefit obligation is spread evenly over the entire period of employment. This may lead to differences between employer contributions and service cost. The employer contributions paid amounted to CHF 104 million in 2016 (previous year: CHF 95 million) and service cost to CHF 133 million (previous year: CHF 120 million). The higher current service cost is attributable to the current membership base used for the method of calculation under IPSAS 25 and the actuarial assumptions used. Pension costs increased due in particular to the past service cost that resulted from the first-time recognition of contributions to the pension fund for professors.

In the reporting period, the ETH Board made a contribution of CHF 3.5 million to the ETH Domain's employee benefit scheme. For ETH Zurich, this amount is reflected in the actuarial valuation as a pro rata employer contribution (CHF 1.7 million). The share of the contribution leads to a difference compared with the net pension costs actually recognised (see note 6), as this contribution was not charged on to ETH Zurich.

Change in present value of defined benefit obligations and fair value of plan assets

CHF million	2016	2015	Change absolute
Present value of defined benefit obligations as of 1.1.	3,984	3,780	204
Past service cost	15	0	15
Current service cost (employer)	133	120	13
Interest expense	16	29	– 13
Contributions by plan participants	53	51	2
Benefits paid	– 163	– 149	– 14
Actuarial gains (–)/losses (+) arising from experience adjustments	65	30	36
Actuarial gains (–)/losses (+) arising from changes in assumptions	249	122	127
Present value of defined benefit obligations as of 31.12.	**4,353**	**3,984**	**369**

CHF million	2016	2015	Change absolute
Fair value of plan assets as of 1.1.	2,997	3,084	– 87
Contributions by the employer	104	95	9
Contributions by plan participants	53	51	2
Benefits paid	– 163	– 149	– 14
Expected return on plan assets	82	91	– 9
Actuarial gains (+)/losses (–) on plan assets	61	– 176	237
Fair value of plan assets as of 31.12.	**3,134**	**2,997**	**137**

Amounts directly recognised in equity

CHF million	31.12.2016	31.12.2015	Change absolute
Actuarial gains (–)/losses (+) on plan liabilities arising from changes in assumptions	249	122	127
Experience adjustments on plan liabilities	65	30	36
Actuarial gains (–)/losses (+) on plan assets	– 61	176	– 237
Allowance for true-up of opening balance sheet	0	0	0
Effect of the limit in paragraph 69(b)	0	0	0
Total amount recognised in equity	**254**	**328**	**– 74**
Cumulative amount of gains (–)/losses (+) recognised in equity	**818**	**565**	**254**

Plan assets invested in each asset category

In %	31.12.2016	31.12.2015	Change absolute
Liquidity	2.38	2.24	0.14
Shares	29.89	30.44	– 0.55
Bonds	60.40	58.21	2.19
Mortgages	0.39	0.46	– 0.07
Real estate	4.99	5.00	– 0.01
Commodities	1.95	3.65	– 1.70
Total	**100.00**	**100.00**	**0.00**

The expected return is determined based on the asset allocation of ETH Zurich's employee benefit scheme.

Actual return on plan assets

CHF million	2016	2015	Change absolute
Expected return on plan assets	82	91	– 9
Actuarial gains (+)/losses (–) on plan assets	61	– 176	237
Actual return on plan assets	**143**	**– 85**	**228**

Actuarial assumptions and historical data

The present value of the defined benefit obligation (DBO) is determined annually by independent actuaries using the projected unit credit method. This requires actuarial assumptions.

Actuarial assumptions used to determine the net defined benefit liability

In %	2016	2015	Change absolute
Discount rate	0.20	0.40	– 0.20
Underlying consumer price inflation	0.50	0.60	– 0.10
Expected rate of salary increases	0.90	0.90	0.00
Expected rate of pension increases	0.00	0.00	0.00
Expected rate of return on plan assets	2.00	2.75	– 0.75

Actuarial assumptions used to determine profit and loss charge

In %	2016	2015	Change absolute
Discount rate	0.40	0.80	– 0.40
Underlying consumer price inflation	0.60	0.80	– 0.20
Expected rate of salary increases	0.90	1.15	– 0.25
Expected rate of pension increases	0.00	0.10	– 0.10
Expected rate of return on plan assets	2.75	3.00	– 0.25

Historical data

CHF million	2016	2015	2014	2013
Fair value of plan assets as of 31.12.	3,134	2,997	3,084	2,914
Present value of defined benefit obligation from funded plans as of 31.12.	– 4,338	– 3,984	– 3,780	– 3,399
Surplus (+)/deficit (–)	**– 1,204**	**– 987**	**– 696**	**– 485**
Present value of defined benefit obligation from unfunded plans	– 15	0	0	0
Experience adjustments on plan assets	61	– 176	83	n/a
Experience adjustments on plan liabilities	– 65	– 30	– 4	n/a

23 Dedicated third-party funds

CHF million	31.12.2016	31.12.2015	Change absolute
Swiss National Science Foundation (SNSF)	229	236	– 6
Commission for Technology and Innovation (CTI)	32	23	10
EU Framework Programmes for Research and Innovation (FP)	169	165	4
Special federal funding of applied research	24	28	– 4
Industry-oriented research (private sector)	35	33	2
Other project-oriented third-party funding	21	24	– 3
Donations and bequests	127	128	– 1
Total dedicated third-party funds	**638**	**636**	**2**

Dedicated third-party funds reflect the outstanding performance obligations to donors at the reporting date. Their purpose is generally specified and the amount depends on the project volume and stage of completion.

CTI and EU projects showed the sharpest rise in dedicated third-party funds, partly as a result of the number of new projects for which financing had been provided, but which had used little of that financing to date because they are in the initial phase.

Dedicated third-party funds from SNSF projects and applied research declined, partly as a result of the stage of completion of SNSF projects.

24 Contingent liabilities and contingent assets

Contingent liabilities

Contingent liabilities for litigation amounted to CHF 0.1 million at the end of 2016.

Contingent assets

CHF million	31.12.2016	31.12.2015	Change absolute
Off-balance sheet receivables	0	1	– 1
Other	0	0	0
Total contingent assets	**0**	**1**	**– 1**

There were no contingent assets at the end of 2016.

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 cannot be quantified reliably. These comprise around 40 research agreements the Swiss National Science Foundation has with several contracting parties, 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.

25 Financial commitments

CHF million	31.12.2016	31.12.2015	Change absolute
Financial commitments up to 1 year	8	37	– 29
Financial commitments from 1 to 5 years	0	4	– 4
Financial commitments > 5 years	0	0	0
No due date / indefinite	0	0	0
Total financial commitments	**8**	**41**	**– 33**

At the end of 2016, financial commitments relating to the purchase of technical/scientific equipment were significantly lower than in the previous year, when there was a financial commitment relating to the purchase of IT capital goods for the Swiss National Supercomputing Centre (CSCS) in Lugano.

26 Operating leases

CHF million	2016	2015	Change absolute
Due dates			
Due within 1 year	21	16	5
Due within 1 to 5 years	61	41	19
Due after more than 5 years	42	40	2
Future minimum payments for non-cancellable operating lease as of 31.12.	**124**	**97**	**26**
Leasing expenses			
Minimum lease payments	19	17	2
Conditional lease payments	0	0	0
Payments from subleasing	1	0	1
Leasing payments of current period	**20**	**17**	**3**
Additional details			
Future revenue from sublease (from non-cancellable contracts)	2	0	1

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

27 Foreign exchange differences

Realised and unrealised foreign exchange gains and losses in the reporting period resulted in a negative foreign exchange difference of CHF 0.1 million overall.

28 Remuneration of key management personnel

The key management personnel of ETH Zurich are the five members of the Executive Board. The remuneration is disclosed in the section entitled Governance and sustainability (page 71).

29 Events after the reporting date

ETH Zurich's financial statements were authorised for issue by the ETH Zurich President and Vice President Finance and Controlling on 3 March 2017. 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 2016.

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

Reg. No. 1.17023.934.00120.002

Report of the statutory auditor

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

Report of the statutory auditor on the financial statements
As statutory auditor, and in application of article 35a*bis* of the Federal Act on the Federal Institutes of Technology (SR 414.110), we have audited the enclosed financial statements of the Swiss Federal Institute of Technology of Zurich (ETH Zurich) which comprise the balance sheet, statement of financial performance, cash flow statement, statement of changes in equity and notes (pages 82 to 109) for the year ended on 31 December 2016.

Responsibility of the Executive Board of the ETH Zurich
The Executive Board of the ETH Zurich is responsible for the preparation of the financial statements in accordance with 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 which is based on the Ordinance, SR 414.123, especially Art. 4). This responsibility includes designing, implementing and maintaining an internal control system relevant to the preparation of financial statements that are free from material misstatement, whether due to fraud or error. The Executive Board of ETH Zurich is further responsible for selecting and applying appropriate accounting policies and making accounting estimates that are reasonable in the circumstances.

Auditor's responsibility
Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Swiss Law and Swiss Auditing Standards. Those standards require that we plan and perform the audit to obtain reasonable assurance as to whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers the internal control system relevant to the entity's preparation of the financial statements 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 entity's internal control system. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made, as well as evaluating the overall presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Audit opinion
In our opinion, the financial statements of the ETH Zurich for the year ended on 31 December 2016 comply with legal requirements and the Accounting Manual for the ETH Domain. We recommend that the financial statements submitted to you be approved.

Report on other requirements
The Swiss Federal Audit Office is independent based on the Federal Auditing Act (SR 614.0) and there are no facts incompatible with its independence.

In accordance with the Federal Auditing Act and Swiss Auditing Standard 890, we confirm that an internal control system exists, which has been designed for the preparation of the 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 financial statements. Likewise, we confirm that no contradictions exist between the financial figures in the annual report (management report) and the 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.

Berne, 3 March 2017 SWISS FEDERAL AUDIT OFFICE

Regula Durrer
Licensed audit expert

Dieter 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 as a business location 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.

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