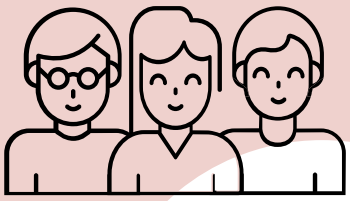
ETH BOARD

ANNUAL REPORT OF THE ETH BOARD ON THE ETH DOMAIN 2023

ETH Domain

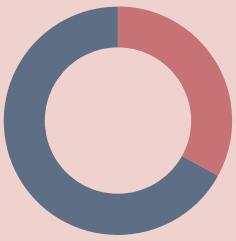
FACTS & FIGURES 2023

Students and doctoral students



38,437

students and doctoral students



32.7%

proportion of women

Employees

with employment contracts

14,932 scientific personnel

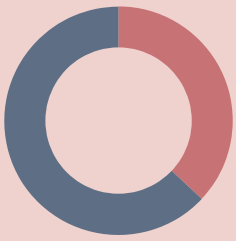
4,312 technical personnel

4,262 administrative personnel

24,890

employees

including professors, doctoral students and apprentices



36.7%

proportion of women

478

apprentices

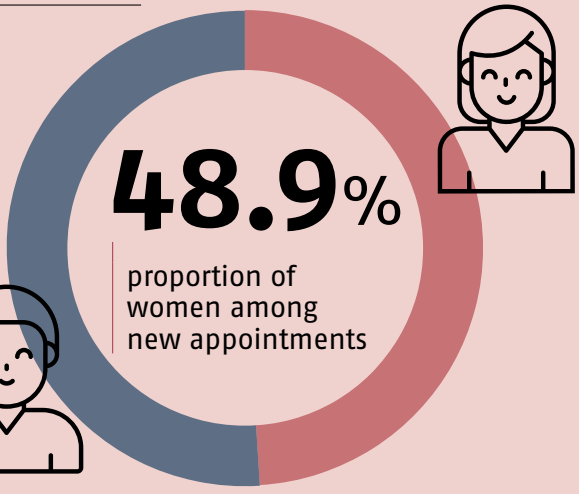
Professors

906

82 appointments, ofwhich

45 newly appointed persons

37 promotions

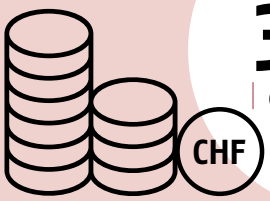


48.9%

proportion of women among new appointments

Total revenue

3,967
CHF million

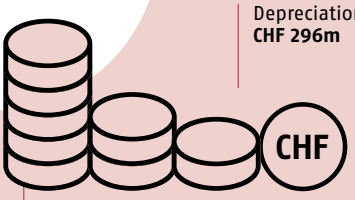


Total federal contribution[1]
CHF 2,730m

Revenue from third-party funding
CHF 1,237m

Expenses

3,944
CHF million



Depreciation
CHF 296m

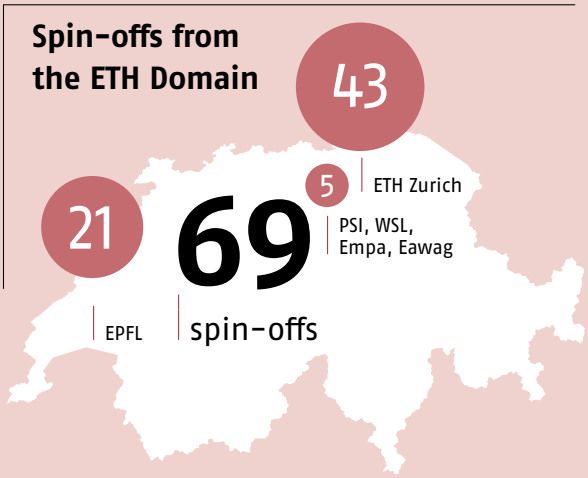
Personnel expenses
CHF 2,549m

Other operating and transfer expenses
CHF 1,099m

Knowledge and technology transfer

314	invention disclosures
26	software notifications
187	patents
156	licences
69	spin-offs

Spin-offs from the ETH Domain



Number of cooperation agreements[2]

496
private sector

263
public sector

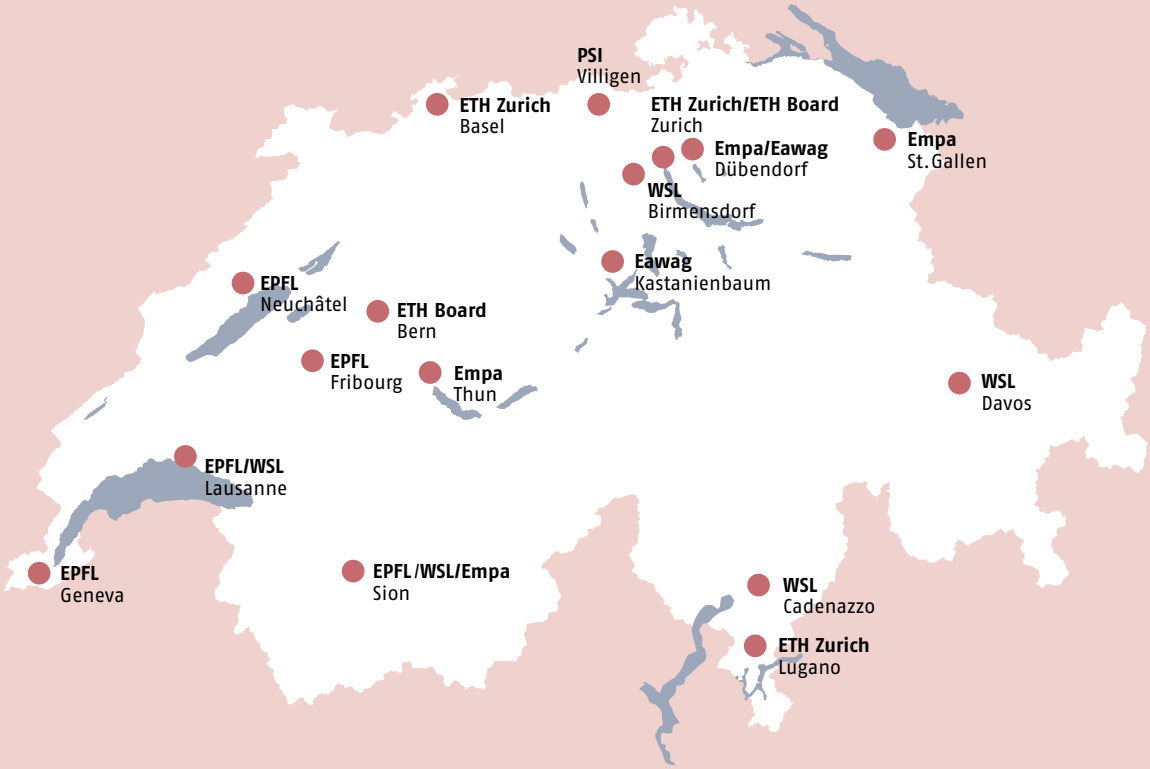
University rankings

THE World ranking	THE Europe ranking	QS World ranking	QS Europe ranking
ETH Zurich			
11	4	7	4
EPFL			
33	8	36	9

[1] Total federal contribution as per the consolidated financial statements for the ETH Domain.
[2] With a volume of at least CHF 50,000 each.

VISION

The ETH Domain strengthens Switzerland's prosperity and competitiveness and contributes to the sustainable development of society through excellence in research and education as well as through scientific knowledge and technology transfer.



The ETH Domain and its institutions
Higher education, research and innovation at the highest level: the ETH Domain provides these services with just under 25,000 employees, around 38,500 students and doctoral students, and a pool of more than 900 professors.

The ETH Domain consists of the two Swiss Federal Institutes of Technology ETH Zurich and EPFL, and the four federal research institutes PSI, WSL, Empa and Eawag. The strategic leadership and supervisory body of the ETH Domain is the ETH Board.
www.ethdomain.ch I www.ethboard.ch

Annual Report of the ETH Board on the ETH Domain 2023

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Financial report:
www.ethboard.ch/financialreport2023

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ETH Domain: Artificial intelligence

AI-based predictions – a blessing or a curse?

Artificial intelligence promises to revolutionise the way we make predictions. But how reliable are such predictions and modelling? What issues of trust arise? We asked the institutions of the ETH Domain how AI can be used to look into the future, and what all this has to do with ChatGPT.

8

2023in review

World-class research in difficult times

The ETH Board remains concerned at Switzerland's lack of association with the Horizon Europe research programme, as well as the difficult financial situation of the Federal Government and the resulting consequences for the ERI sector. The ETH Board remains concerned at the lack of association with the Horizon Europe research programme, as well as the difficult financial situation of the federal government and the consequences of this for the ERI sector.

ETH Zurich: ETH I Space activities

"I'm here to learn, to make things happen"

What do you do after having the most important job in the field of space research? After many years leading research at NASA, Thomas Zurbuchen chose to come to ETH Zurich. But this career step is not as illogical as it might seem, as ETH Zurich aims to become Europe's leading space research institution.

EPFL: Mind-controlled walking

How to trigger nerves and generate headlines

Can paralysed people walk again? Yes, sometimes science achieves something miraculous. We look at what it takes to put an obvious idea into medical practice so that patients can actually benefit from it.

PSI: SLS 2.0 – a "dark period" for the SLS

The light inside the tunnel

The Swiss Light Source at the PSI is undergoing an upgrade to ensure that it remains a centre of excellent research in the future. The Project manager Hans-Heinrich Braun gave us a tour of the construction site.

WSL: Remote sensing – early detection of tree stress

"Forests are complex systems"

Remote sensing specialist Petra D'Odorico likes to fly drones. Not as a hobby, but rather to record high-resolution multispectral and thermal images, which can be used to create an early warning system to detect drought stress in forests before it becomes apparent.

Empa: Mining the Atmosphere

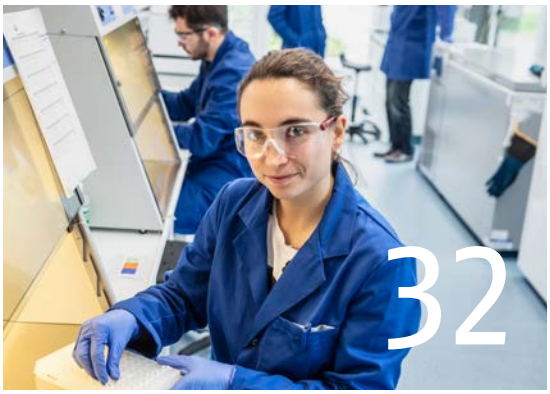
"From scapegoat to saviour"

What role can the construction industry play in combating ever-worsening climate change? Peter Richner thinks it can be a game changer. We speak to the Deputy Director of Empa and Co-Head of the Sustainable Construction research focus area.

Eawag: Wastewater-based epidemiology

All that's left behind

Wastewater-based epidemiology provides valuable insights into the progression of diseases, such as COVID-19, in terms of both viral load and evolutionary dynamics. By analysing data gleaned from wastewater, Eawag is helping medical experts to shed new light on the prevalence of coronavirus infections during the pandemic.



FOREWORD

President of the ETH Board:
Michael O. Hengartner

Dear Readers

The shortage of skilled workers is a major concern in the media and in politics, and it is a particularly crucial issue for the companies affected by it. Some of the most sought-after specialists are information technologists and engineers. Over the past 10 years, the two Federal Institutes of Technology have been able to educate considerably more students and doctoral students in engineering (+38%) and computer science (+120%). But further efforts and investments will be necessary to inspire more young people, especially women, to study STEM subjects and for us to be in a position to offer them an education of the highest quality. The Swiss economy needs these graduates.

However, the ETH Domain is not only making significant investments in teaching to train specialists for Switzerland. It is also investing in research and knowledge and technology transfer to meet the greatest challenges of our time. For instance, ETH Zurich and EPFL launched "Swiss AI" in late 2023. With this initiative, they are seeking to make Switzerland the world's leading location for the development and use of transparent, trustworthy artificial intelligence. In addition, together with PSI

and Empa, they launched a coalition for green energy in June. Working with partners in politics, science and industry, the institutions of the ETH Domain are making advances in developing solutions for the storage and transport of renewable energies.

The ETH Domain is dependent on sufficient, reliable funding to be able to make these urgently needed investments in teaching, research, and knowledge and technology transfer. Because of the Federal Government's reductions in loosely earmarked expenditures and the scrapping of the inflation adjustment, the ETH Domain will have an annual funding shortage of around CHF 80 million starting in 2024. These budget cuts are impacting the ETH Domain at a time when it has already taken a hit to its international appeal and reputation – and will continue to do so – due to Switzerland's lack of association with Horizon Europe.

The welfare and success of our country stem from our outstanding education system and our strong position as a hub for research and innovation. After all, as Benjamin Franklin once said: "An investment in knowledge brings the best return."

The ETH Board hopes that Parliament will continue to give priority treatment to the ERI and ETH Domain and pledge the necessary funding as part of the 2025–2028 ERI Dispatch.

Zurich/Bern, January 2024

Michael O. Hengartner,
President of the ETH Board

The ETH Board reports on the ETH Domain

WORLD-CLASS RESEARCH IN DIFFICULT TIMES

This reporting period included the quadrennial interim evaluation of the ETH Domain. In its response to the expert commission, the ETH Board presented several lines of action with which it and the institutions of the ETH Domain aim to implement the commissions's recommendations. The ETH Board remains concerned about Switzerland's lack of association with the Horizon Europe research programme, as well as the Federal Government's difficult financial situation and the consequences for the ERI sector.

Every four years, the ETH Domain undergoes a detailed evaluation by a group of national and international experts acting on behalf of the Swiss government's Department of Economic Affairs, Education and Research (EAER). These evaluations by an independent expert panel are extremely valuable to the ETH Board and the institutions of the ETH Domain. The Expert Committee of the Interim Evaluation 2023 first gained an impression of the ETH Domain by reviewing the comprehensive self-evaluation report prepared by the ETH Board and the institutions of the ETH Domain, along with supplementary documents on activities, processes and resources. The Committee then spent a week talking to key players on the ETH Board and in the institutions – including representatives of lecturers and students – and interviewing stakeholders in the ETH Domain from the fields of science, business and politics. The analysis of the current strengths and weaknesses, as well as the stimulating and productive discussions with the experts, resulted in forward-looking recommendations that were both helpful and challenging in equal measure.

In summary, the ETH Board is delighted with the excellent overall assessment from the expert commission. The commission emphasised the outstanding quality of the ETH Domain's institutions, and noted the significant progress made in several areas since the last interim evaluation in 2019. Despite this, the ETH Board is aware that the ETH Domain's performance and impact must continue to improve and go further in order for it to be prepared for future challenges. The lines of action for implementing the expert commission's recommendations will enable the ETH Board and the institutions of the ETH Domain to set the course for the Domain's continued development. This is in the interest of the Swiss research and education sector, the economy, and society as a whole.

Top-quality teaching, research and research infrastructure

The ETH Board and institutions of the ETH Domain particularly appreciate the expert commission's recommendations on the quality of education and on maintaining international attractiveness. The ETH Domain has made research-based teaching its utmost priority. In the coming years, the institutions will continue to take the necessary measures to maintain and improve the already high educational standards over the long term as student numbers continue to increase. In doing so, they will be helping to alleviate the shortage of skilled workers in Switzerland. The institutions of

The independent commission of international experts who performed the 2023 interim evaluation of the ETH Domain.
› Ines Egli/ETH Board

the ETH Domain will continue to undertake pioneering research to help anticipate and solve the most pressing challenges at the local, national and global level. One of the main requirements is attracting and retaining the most talented individuals. Another key factor in the ETH Domain's international attractiveness is Switzerland's world-class research infrastructure. The institutions of the ETH Domain will maintain their leading role in conceptualising, developing, running and expanding leading national and international research infrastructure and platforms. The ETH Board and institutions also played a major role in the State Secretariat for Education, Research and Innovation's 2023 Swiss Roadmap for Research Infrastructures, which was published in 2023.

Several wide-ranging expansions to the existing research infrastructure are currently either planned or already underway. The Swiss Data Science Center (SDSC), for example, will be expanded to become a decentralised national digital institute (SDSC+) that will be available to the scientific community, industry and the public across Switzerland. The Swiss National Supercomputing Centre (CSCS) intends to renew its computer and data infrastructure for the Sustained Scientific User Laboratory for Simulation and Data-based Science while at the same time developing additional services. Alongside the institutions of the ETH Domain, the Swiss meteorological office MeteoSchweiz and other Swiss universities will be directly involved in the expansion through a series of collaborative projects.

Innovation in the age of AI

The institutions of the ETH Domain are actively contributing to Switzerland's innovation prowess by further strengthening their key role in the transfer of knowledge and technology for the benefit of industry, business, the public sector and society. One of ETH Zurich and EPFL's areas of focus is artificial intelligence (AI) (see also the report on p. 12 et sqq.). Switzerland currently enjoys an excellent position in AI as the ETH Domain in particular has received significant investment in recent years. The ETH AI Center at ETH Zurich, for example, is a central hub of AI expertise. It works with countless industrial partners to conduct research projects and transfer knowledge. It supports science-based AI start-ups, and is involved in growing start-up and investor programmes across Switzerland and Europe. An AI Center was also established at EPFL in the reporting year that will combine existing initiatives like the Center for Intelligent Systems (CIS),

founded in 2019, as well as all laboratories and centres at EPFL that work on AI-related topics. ETH Zurich and EPFL jointly launched the "Swiss AI" initiative in autumn 2023. It aims to provide Swiss research with an open platform for large language models (LLMs) and position Switzerland as a leading global location for the development and use of transparent and trustworthy artificial intelligence.

The ETH Board believes it is important to bring AI expertise together across Switzerland and provide the necessary infrastructure for research, teaching, and transferring knowledge and technology. This will make Switzerland more competitive and allow it to become one of the leading nations in this field. We cannot allow our economy, society and public sector to become dependent on infrastructure owned by those who do not share our values. The ETH Domain aims to focus on responsible and trustworthy AI, training sufficient numbers of AI experts, supporting AI start-ups, and preparing society for the challenges and opportunities presented by this technology.

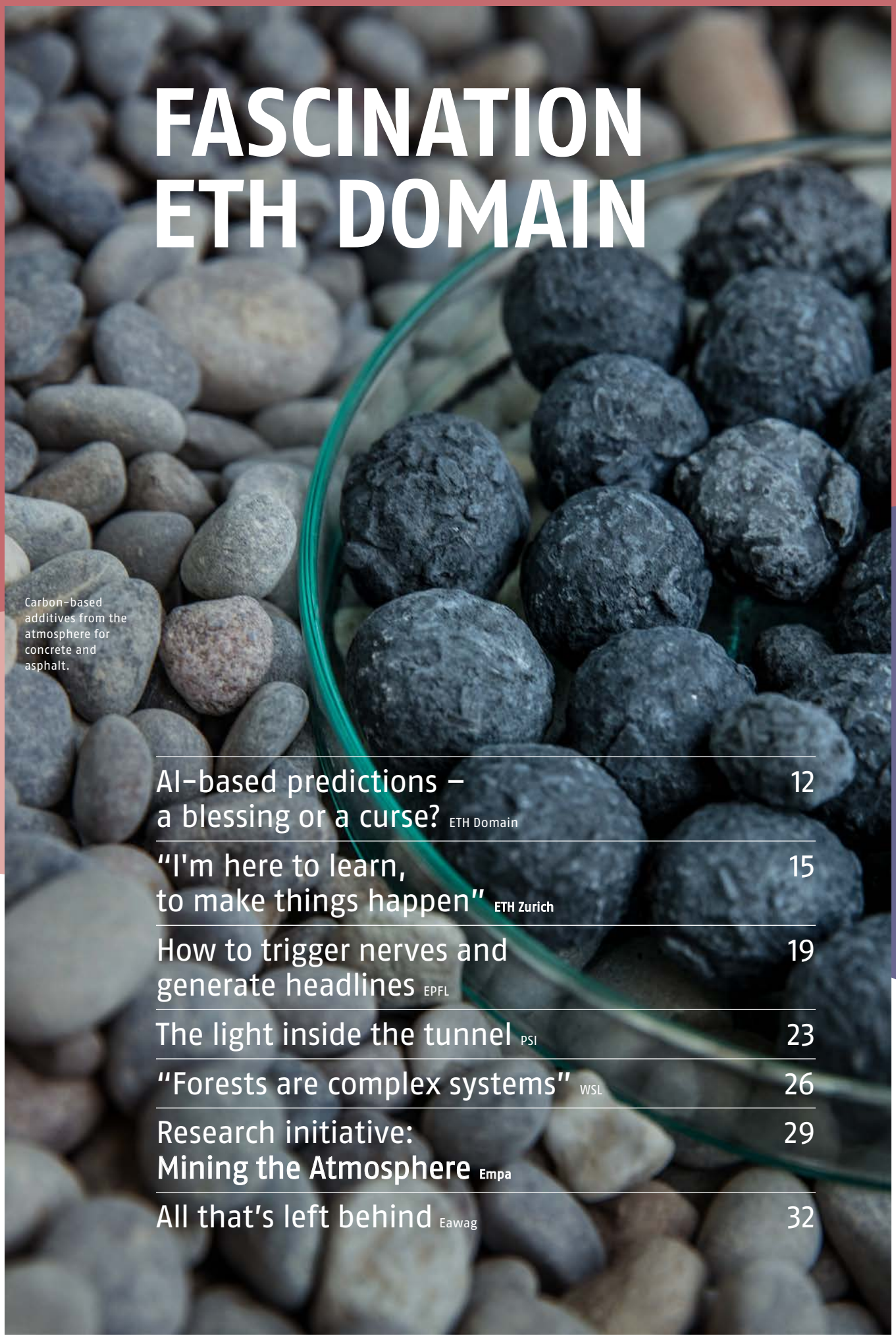
Stable funding and international openness

As student numbers increase, the ETH Domain can only continue to perform its flagship role in the Swiss ERI sector, maintaining educational quality and responding to demand from businesses and public bodies for highly qualified workers, if it has sufficient financial resources. The difficult financial situation at the moment is heavily impacting the ERI sector, particularly the institutions of the ETH Domain. In February 2023, for example, the Swiss Federal Council agreed on a 2% cut to the ETH Domain's 2024 budget and scrapped the inflation compensation. Based on this smaller budget, the ERI Dispatch for 2025–2028 earmarks nominal growth of 1,6%. Given rising staffing costs, higher prices for energy and materials, and growing student numbers, this represents an enormous challenge for the ETH Domain and is viewed with great concern by the ETH Board.

Along with this difficult financial situation, we are also facing is the challenge posed by Switzerland's continued non-associated status with regard to the EU's research and innovation programme Horizon Europe. International openness and multilateral scientific cooperation are essential if our country is to keep pace at the highest international level and defend its excellent position.

In its report, the expert commission that carried out the 2023 interim evaluation emphasised the importance of both stable funding and international openness for the success of the ETH Domain. This is essential when it comes to turning research results into real-life solutions and strategies for reacting quickly to the urgent challenges faced by our society.

FASCINATION ETH DOMAIN



Carbon-based additives from the atmosphere for concrete and asphalt.

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ETH DOMAIN

AI-BASED PREDICTIONS – A BLESSING OR A CURSE?

Artificial intelligence (AI) promises to revolutionise the way we make predictions. But how reliable are such predictions and modelling? What issues of trust arise? There are different approaches to analysing, translating and predicting the future with AI and the ETH Domain has recognised the potential.

A scientific theory works when it makes reliable predictions about future events or conditions. It involves building a model of the world, deriving predictions from that model and testing those predictions. Understanding why something is happening is different story. And while AI may never be able to understand the "why", what it can do very well is deal with data.

AI is often equated with GPT and other generative models, but the recent successes of machine learning and AI are far more significant than the hype surrounding GPT. After all, the secret of the progress made by language models, which even experts deem amazing, is nothing other than their predictive power. These indescribably large neural networks have not actually cracked the "problem" of language. They are simply much better than their predecessors at guessing the most likely continuation of a sentence. What amazes us so much about the result is "only" the prediction of the next word.

Language models also learn from images

"Finding the right next word – that's a pretty difficult task," counters Robert West, Assistant Professor of Computer Science at **EPFL,** where he heads the Data Science Lab (dlab) and researches these kinds of language models. "It takes a little understanding of the world to do this well. " This leads us to the central issue of the current AI debate: are language models more than just models for language? Recently, these models have been learning not only language or images, but everything at once. "The image input then improves the language system. One model reinforces the other," says West. These "multimodal" models could then actually learn things simply by looking at them. As an example, West cites the simple fact that "if you let go of something, it falls to the ground".

What would happen if robots were equipped with such systems? "Human intelligence is anchored in the physical world," says West. According to him, children are really "little researchers", and people learn all the time through trial and error; machines could do that too. Artificial intelligence can already do a great deal of work for human scientists.

"Language of nature" as a role model

Modelling, testing and validation: Siddhartha Mishra, a professor at **ETH Zurich,** knows the three-pronged scientific approach well. The mathematician and machine learning expert has been working on teaching machines this type of analysis for a long time. Mishra specialises in partial differential equations, a mathematical tool that can be used to describe many natural processes. He calls them the "language of nature". However, working with this language is much more complex than what ChatGPT and similar tools can handle. Human language is ultimately a highly compressed version of the world. "Modelling natural systems is a far greater challenge due to their inherent complexity."

But, according to Mishra, we already have a much greater knowledge of nature, which we simply have to incorporate into the models, adding that previously, solving partial differential equations would have necessitated the use of a supercomputer due to the computational demands. AI now makes such problems considerably easier to manage. Mishra collaborated with Empa researchers to develop fast algorithms for simulating laser manufac-


Midjourney generated image

turing processes for 3D printing. Thanks to AI, the simulation time has been reduced from four hours to microseconds, enabling real-time simulation and printing. The use of partial differential equations is also common in tsunami early warning systems. Mishra's approach could be lifesaving if it can quickly calculate the simulation of expected events following an earthquake.

Energy policy scenarios

Philipp Heer, who is responsible for AI in the construction and energy sector at **Empa**'s Digital Hub (dhub), explains that AI is used to solve classic optimisation problems, such as efficient house heating. Additionally, AI is used to calculate energy policy scenarios for Switzerland. However, issues of trust arise when machines dictate future policy decisions. Heer argues that AI generally performs tasks in a similar way to human experts, but at a much faster rate. "The outcome would be comparable to that of 10 researchers working on the problem for 10 years." According to Heer, the current systems allow for the modelling of a significantly greater number of scenarios.

Nowcasting urban flooding

João P. Leitão, group leader in the Urban Water Management Department at **Eawag**, does not speak of "forecasting" in this context, but rather of "nowcasting". Forecasting urban flooding events after heavy rainfall is only possible through the use of AI models. Previously, computers would have had to be run for hours in order to obtain similarly high-resolution simulations – any warnings would then come too late.

This raises thoughts of science fiction. Will it be possible to simulate everything in the near future? Will AI be able to calculate any possible data sequence accurately? Mishra says that physical modelling has not yet paralleled ChatGPT's trajectory, meaning that there has been no magic moment yet. However, with the current pace of progress, it is difficult to predict where things are headed. Regardless, Mishra remains hopeful and optimistic: "My main research goal is to develop an AI that can model nature as effortlessly as GPT models language."

West also believes that current models can do much more than generate language outputs: "They are used as next-word predictors. However, this prediction is not necessarily limited to words." With the appropriate data, it can also work with credit card transactions, online behaviour and even gene sequences.

Prediction of plankton growth

Models and success stories are ubiquitous. With this in mind, Marco Baity-Jesi takes a more grounded view of current developments. As a physicist, he researches both applied and theoretical AI approaches at **Eawag,** such as simulating plankton growth in lakes. The benefits of AI are evident: it can handle vast amounts of data, model complex systems even with incomplete information and make accurate predictions. However, this strength also calls for caution, as the future is inherently uncertain, and predictions are only accurate to a limited extent. "We have a tendency to fall in love with our models all too easily," he says. "And validating the results is often not so straightforward." A lack of critical thinking in the AI community could be a concern, he believes, and it is essential to evaluate the reliability of predictions.

Recognition of systematic errors

Konrad Bogner, a **WSL** hydrologist, is familiar with the phenomenon. An old hand in the field of AI predictions, he worked with neural networks for his doctoral thesis 20 years ago to model run-off volumes after storms. Although hardly anyone had heard of the term back then, today everyone is trying AI. While the buzzword makes it easier to sell scientific work, it is important to consider whether there is an actual benefit at all. While simpler means may suffice for some fields of application, a differentiated approach can offer significant potential, as Bogner suggests. For instance, AI modelling can help identify systematic errors in predictions, a phenomenon known as "bias" in language models. These models are not neutral and can adopt our biases, and the same is true in the fields of meteorology

in meteorology and hydrology. Highlighting the weaknesses in conventional models can help us to spread awareness of these weaknesses.

Mishra argues that models that simulate natural phenomena have an advantage due to their "groundedness", as opposed to models like ChatGPT that attempt to master the ambiguous concept of language. "In natural phenomena, 'truth' is well-defined," as evidenced by the accuracy of weather forecasts. We have extensive experience in testing model accuracy related to natural phenomena, but what about in the context of medical diagnoses? When asked if he would trust a machine-assisted system in this field, Mishra did not hesitate to answer affirmatively: "I would trust it without giving it a second thought." His wife is a doctor, and he feels certain that she and her colleagues also use machine learning. "Many people don't realise that doctors also work with models, constantly approximating the truth." Therefore, the combination of human and algorithmic approaches makes sense to him.

Early detection of cancer

Researchers at the **PSI** are currently exploring what this could look like in practice. G.V. Shivashankar, Head of the Laboratory of Nanoscale Biology at the PSI and Professor of Mechano-Genomics at ETH Zurich, uses image recognition AI to elicit medically relevant information from specific blood cells.

What was actually developed to identify objects in photos helps to recognise the ageing processes in cells or to enable the early detection of cancer. The researchers are taking advantage of the fact that DNA is "packaged" differently depending on the state of a cell, which can be visualised using appropriately sensitive microscopy techniques.

With the help of semi-supervised learning (hybrid technology that uses labelled and unlabelled data), the AI can be trained to recognise level while also acknowledging blood cells in a body in which a tumour is growing with a high degree of accuracy. "It has always been our underlying assumption that every cell is important in understanding disease," explains Shivashankar. However, tracking clinically relevant changes at the level of individual cells is very challenging and can only be achieved with AI. He considers the current processes to be "so powerful" and their application in medicine so beneficial that completely new AI methods will emerge from this synergy. He is convinced that diagnostics at an early stage of the disease will become far more important than it is today.

Man-machine

What is clear is that the relationship between humans and machines will undergo a significant shift in the coming years. Heer notes that this shift has already been felt in the building sector, where the automation of heating systems has highlighted our "desire to control our environment". People are suspicious of automatic, self-regulating systems.

Leitão also believes that AI-supported processes will require human control. The way AI systems are currently built, they lack the crucial human capacity for decision-making: "The concrete decisions always have to be made by humans."

West believes that political regulation is necessary to renegotiate this relationship. He commends current efforts at the EU level while also acknowledging the potential of AI methods, particularly in the medical field. However, regulating AI is not the same as regulating industrial robots or a steam engine due to the models' ability to improve themselves: "They can explore the real world to understand how it works." It is currently challenging to predict whether this will result in a significant improvement in the models. "If such a development occurs, humans may no longer be able to make predictions" about the future of AI.

For West, one thing is certain: "Something big is coming." ChatGPT has made the general public aware of this. "Language is so obvious a choice because it's so human, and because so much can be expressed in language. But it's not going to stop there."

"People learn all the time through trial and error. Machines can do that too."

– Professor Robert West, Head of the Data Science Lab (dlab), where he researches language models

ETH ZURICH

"I'M HERE TO LEARN, TO MAKE THINGS HAPPEN"

What do you do after having the most important job in the field of space research? After many years heading up research at NASA, Thomas Zurbuchen chose to come to ETH Zurich. But this career step is not as illogical as it might seem, as ETH Zurich aims to become Europe's leading space research institution.

"I want to launch one of the world's best interdisciplinary Master's programmes in space science and technology to train the next generation of space leaders." Thomas Zurbuchen, Professor of Space Science and Technology at ETH Zurich.

"To explore strange new worlds, to seek out new life and new civilisations": that was the mission of the Starship Enterprise in Star Trek. And it seems a galaxy away from the more down-to-earth attitude in Swiss engineering. It conjures up notions of unlimited opportunities, big ideas and budgets of the kind that Thomas Zurbuchen enjoyed as Head of Research at NASA. Zurbuchen came to ETH Zurich to give new momentum to ETH I Space, which was launched at the end of 2022, as well as to its space-related activites. Doing so successfully means establishing a network and dialogue with all departments at ETH Zurich that have already pursued pioneering research in this area.

"Incredible potential" Switzerland's technological strengths – precision, pioneering research and cutting-edge technology – are in particularly high demand in the field of space research.

Zurbuchen explains that the space sector is booming like never before: "We are seeing 10% growth every year." For Switzerland, he sees an incredible amount of potential in space research, as this area specifically calls for the kind of "deep tech" engineering at which the country excels, with its precision, pioneering spirit and cutting-edge technology. Zurbuchen believes that ETH Zurich is well placed to take advantage of this potential: "We are not starting from zero. The future is already there, we just have to scale it." The list of ETH projects that have been blasted into space is indeed impressive, from the Large Interferometer for Exoplanets, a mission led by ETH Zurich for researching exoplanets, to its involvement in developing one of the most important space research instruments – the James Webb Space Telescope. The university also plays a leading role in the use of satellite data for environmental research. Zurbuchen wants to combine the existing activities in the newly founded entity to make them more effective. He knows how to bring people together and create synergies, particularly in terms of education, research and entrepreneurship. Almost immediately after arriving at ETH Zurich, he set up a team consisting of four departments and the Rectorate to start Switzerland's first Master's degree programme in space systems next summer in 2024.

It is obvious that Zurbuchen values entrepreneurial dynamism. The explosive growth in the sector is due in large part to the increasing number of commercial programmes targeting space. Zurbuchen wants to strengthen this pioneering spirit in Switzerland too, as he sees the private sector as being much better suited to developing new innovations than the government. Arguably the best example of this is Elon Musk and his audacious rocket experiments. According to Zurbuchen, it is this impetuousness of youth that is so urgently needed. He wants to turn Switzerland into a home for bright young minds who want to conquer space. Luxembourg is another country that has successfully positioned itself in recent years as a hotspot for exploring commodities from beyond the Earth. Zurbuchen believes we can take this tiny country's success in creating new markets as an example, although he sees Switzerland's strengths as being concentrated more in research. The focus now should be on launching more interesting sensors and high-quality research approaches into space.

But how does he view the ethical conditions of more profit-oriented organisations expanding into the final frontier? Zurbuchen mentions the Artemis Accords, which aim to govern the research and use of the moon at international level. To quote the accords: "to establish a common vision via a practical set of principles [... for] the civil exploration and use of outer space." Zurbuchen underlines this and emphasises the importance of international cooperation, even if it is not easy: "We are going in the right direction." And who knows? Maybe Switzerland will become one of the big players, given its experience in both high-tech sensors and crafting international agreements.

Zurbuchen is refreshingly open about the uncertainty surrounding how exactly this metaphorical rocket will be launched for Switzerland: "I'm here to learn, to make things happen." It is easy to believe Zurbuchen when he says his outsider status is a strength rather than a weakness. After all, one of the reasons for his success in the US was that he was a foreigner who first had to gain an understanding of the cultural differences. Now the story is repeating itself in reverse.

World record: From 0 to 100 km/h in 0.956 seconds

Watch the world record run on YouTube.

For almost a year, students at ETH Zurich and the Lucerne University of Applied Sciences and Arts spent every free minute they had working on their "mythen" electric race car. Applying the theoretical knowledge from their course has led to great success. As confirmed by Guinness World Records, "mythen" smashed the previous acceleration record for an electric vehicle by over a third. The race car accelerated from 0 to 100 km/h in just 0.956 seconds. The students developed all of the car's components themselves. Thanks to its lightweight carbon and aluminium framework, "mythen" weighs only around 140 kg. Four wheel hub motors and a special powertrain give the vehicle an impressive 240 kW of power (326 HP).

A new space for clinical research

Read more.

Kantonsspital Baden (KSB) and ETH Zurich have worked together since 2017. Initially, this was mainly in teaching, as the first 100 students enrolled for the newly created Bachelor's degree programme in human medicine at ETH Zurich. Increasingly, however, the collaboration has grown to include clinical research. Now three ETH Zurich professors are moving into new premises on the hospital's healthcare campus. "We want our basic research and engineering developments to benefit people even more than before in the form of medicines, treatments, diagnostic procedures or medical devices," says Christian Wolfrum, Vice President for Research at ETH Zurich. Together, KSB and ETH also want to push ahead with the digitalisation of healthcare data and its use in research.

KSB offers researchers a practice-based environment and benefits from ETH Zurich's expertise and innovation capacity.
› Alessandro Della Bella/ ETH Zurich

Producing green energy with chicken feathers

More about the chicken feathers.

Huge amounts of waste and by-products are created in food production, such as in the poultry industry. Around 40 m tonnes of chicken feathers are incinerated every year. This releases large quantities of CO_2 and toxic gases into the atmosphere. Researchers at ETH Zurich and Nanyang Technological University in Singapore (NTU) have now found a way to make better use of these feathers. They use a simple, environmentally friendly process to extract keratin, which makes up 90% of the feathers, and turn it into extremely fine fibres, which can then be used in the membrane of a fuel cell. Fuel cells produce CO_2-free electricity from hydrogen and oxygen, and could become an important source of green energy in the future. Conventional membranes are made using highly toxic and expensive chemicals. By contrast, the membrane developed by the researchers from ETH Zurich and NTU consists mainly of organic keratin. This is more environmentally friendly and up to three times cheaper to produce in the laboratory.

Researchers at ETH Zurich and Nanyang Technological University are using chicken feathers to make fuel cells more cost-effective and sustainable.
› Adobe Stock/generated by AI

55th International Chemistry Olympiad held in Switzerland for the first time

In July 2023, Switzerland hosted the International Chemistry Olympiad (IChO) for the first time at ETH Zurich. A total of 348 students from 89 countries met for an amicable competition, putting their chemistry knowledge to the test. The tasks, developed by the scientific committee under the direction of ETH Zurich Professor and three-time IChO participant Wendelin Stark, were quite challenging. "Five hours of practical chemistry in the lab and five hours of theory back to back – at the university level – where even the world's best face a big challenge," explains Stark. "I am, therefore, very impressed by the dedication and expertise that the students have shown over the past week." In addition to the exams, the participants had the opportunity to get to know Switzerland and its outstanding research and teaching through an extensive social programme. They visited the PSI, Empa, Eawag and Lonza, a site for research and development in manufacturing in Visp. They also went on trips to the picturesque mountain of Rigi and Bern's historic city centre.

Read more.

Out of 348 participants, 217 were awarded gold, silver or bronze medals. The Swiss team took home an "honourable mention".
› ETH Zurich

How an apprentice uses "made-up" electrons to save researchers time

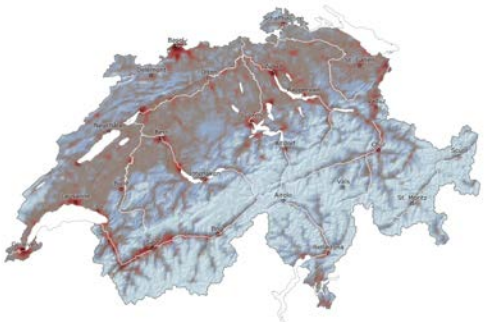
Jingo Bozzini, an electronics apprentice at ETH Zurich, produced a test device for his final project that will save physicists a lot of time in developing a novel microscope. "In experimental physics in particular, it's important that we have experts who can solve technical problems and implement things effectively," explains Yves Acremann from the Solid State Physics Research Group. The close collaboration between researchers and apprentices is a hallmark of vocational training at ETH Zurich. The aspiring electronics engineers spend the first two years of their education in the electronics training lab, where they learn the basics of circuit technology, manufacturing and measuring technology, and programming. For the next two years, they complete an apprenticeship with-in ETH Zurich – in a research lab, for example. Together with Acremann, Bozzini published a scientific article on his test signal generator in the *Journal of Instrumentation*.

More about Bozzini.

Knowing where earthquakes will cause damage

A devastating earthquake with a magnitude of 6.0 occurs every 50 to 150 years on average in Switzerland or near the Swiss border. "Until now, we knew little about what effects earthquakes could have in Switzerland," says Stefan Wiemer, Director of the Swiss Seismological Service (SED) at ETH Zurich. The SED, together with the Federal Office for the Environment and the Federal Office for Civil Protection, therefore created an earthquake risk model for the first time on behalf of the Federal Council. The seismologists combined information about earthquake risk, effects of the local substrate, building vulnerability, and affected persons and assets. The seismic risk model is intended to help government agencies make informed decisions in terms of earthquake preparedness and incident management.

Read more.



Earthquake risk map. dark red zones mean very high risk; light blue zones mean very low risk.
› Swiss Seismological Service (SED)

EPFL

HOW TO TRIGGER NERVES AND GENERATE HEADLINES

Can paralysed people walk again? Yes, sometimes science achieves something miraculous. But what does it take to put an obvious concept into medical practice so that patients can actually benefit from it?

Neurosurgeon Prof. Jocelyne Bloch (right) and neuroscientist Prof. Grégoire Courtine, both at Lausanne University Hospital, UNIL and EPFL, jointly head the. NeuroRestore centre.

It's not that often that sensational scientific news is also easy to understand. In spring 2023, an announcement of this kind went around the world from Lausanne: scientists had developed a technology that allows paralysed people to walk again! The two researchers – Jocelyne Bloch, Professor at the University of Lausanne (UNIL) and Grégoire Courtine, Professor at EPFL – both of whom are also adjunct professors at EPFL and UNIL, respectively, and work at Campus Biotech in Geneva, were finally able to announce the breakthrough of their brain-spinal cord interface. Initial tests were promising, but now the digital miracle has demonstrated its effects on a person for the first time: The implant successfully bridged the spinal cord injury in the cervical spine of a patient who was paralysed after a cycling accident. The patient was able to stand, walk and even climb stairs again.

Marc, 62, has been living with Parkinson's disease for almost three decades. Now he can even climb stairs again.

How can something like this be made possible? By taking a very interdisciplinary approach, the two scientists emphasise. And that doesn't just mean combining neurological and surgical expertise, which they each bring to the project, but also in-depth AI knowledge, knowledge in the field of robotics, and a range of skills that are not directly related to specialist knowledge.

As a renowned neuroscientist and neurosurgeon, Bloch regularly receives calls from researchers "with a brilliant idea," she says. But it takes more than that – that little bit extra – to turn an idea, however brilliant it may be, into a functioning medical project. She immediately sensed this "small but critically important extra" in Courtine: his energy and, not to be underestimated, his organisational talent. She was "immediately enthusiastic" about the real prospect of helping people with injured spinal cords after early successes in animal experiments. Courtine adds that it also takes a lot of perseverance – after all, he has been working on this idea for around 20 years. "And also a good dose of luck."

"The idea of developing a neuroprosthetic that stimulates the spinal cord electrically to correct locomotor disorders in patients with Parkinson's is the result of several years of research on the treatment of paralysis due to spinal-cord injuries," explains Grégoire Courtine.

The contact between Bloch and Courtine was established by former EPFL President Patrick Aebischer, and he had the right instinct: The collaboration between the two scientists is already well advanced, and yet this may only mark the beginning of a much more important project. There are many indications that the stimulation technology has finally been perfected – even if Bloch and Courtine emphasise that it is still in the trial phase and that the safety of the procedure first needs to be validated. Following the headlines in spring 2023, an article was published in *Nature* in October in which the two scientists announced that the technology was also showing good results in Parkinson's patients with walking difficulties. "There's more in the pipeline," notes Courtine, "I can't reveal too much yet, but we're on the trail of special neurons that have a kind of repair function and that also respond to electrical stimulation."

Incidentally, this next significant discovery had already been hinted at in the first *Nature* article in the spring. The walking training with the digital bridge appeared to help the patient to gradually regain lost neurological functions. The researchers registered remarkable improvements in his sensory and motor skills, even when the implant was deactivated. This suggests that new nerve connections had formed as a result of the stimulation.

Courtine says that, as a physicist, he quickly realised that he didn't want to do pure basic research, but rather something application-related that touched on a real scientific problem. This led him to neurological research, and so the idea of bridging damaged nerve connections using the latest methods began to grow. Developing an idea in the laboratory is one thing, but successfully integrating it into a human body so that it results in a real patient benefit is quite another.

"I would say we complement each other quite well," says Bloch, who contributes the medical expertise and has the "boldness" to try the untested in the operating theatre, as Courtine puts it. However, the project not only offers her the opportunity to carry out pioneering clinical work, but also enables her to learn a lot about how neuronal connections function and, more importantly, about their regenerative capacity. So it could well be that Lausanne is currently not only demonstrating the potential of high-tech medicine made in Switzerland, but also starting a new chapter in the history of neurology.

"The Panorama of the Battle of Morat": digitalising a Swiss national treasure

See and read more.

The famous painting "The Panorama of the Battle of Morat", produced by the German artist Louis Braun in 1893 on around 1,000 m^2 of canvas, has never been put on permanent exhibition. After briefly going on display, the epic work has spent the last 20 years in a military storage facility. Now, the painting has been reproduced as the largest digital image in the world (approx. 1.6 terapixels). This was all made possible thanks to an extraordinary camera that took around 400,000 pictures of the painting's surface, together with a specially made mechanical support and painstaking restoration work at EPFL's Laboratory for Experimental Museology (eM+). This process aims to spawn a series of initiatives on data science and processing, as well as to create an interactive 360-degree experience for the public. Thanks to technologies like artificial intelligence, it was not only possible to study the artist's every last brushstroke, but also to bring the painting to life.

Analysing the condition of the painting before the digital reproduction process
› EPFL

Filters for capturing hydrogen

Efficiently producing clean hydrogen is a key challenge for meeting the world's future energy needs. Researchers at EPFL in Sion specialising in metal-organic frameworks (MOFs) have succeeded in developing a membrane measuring just a single cell in thickness that can deliver previously unachievable performance when separating hydrogen from nitrogen. "This enables an extraordinary combination of hydrogen flow and selectivity that offers huge potential for highly efficient applications in gas separation," says Professor Kumar Varoon Agrawal, who was behind the discovery. Metal-organic framework technology is booming and can also be used to capture CO_2 or purify water – applications that are also being researched at EPFL.

30 years of plasma at the heart of EPFL

In September 2023, the Swiss Plasma Center (SPC) celebrated the 30th anniversary of the tokamak (TCV), a globally renowned research facility dedicated to the development of nuclear fusion. Scientists here heat a gas made from deuterium – a hydrogen isotope – to over 100 million degrees. A complex magnetic field has to retain the plasma in the centre of the chamber so that it does not touch the walls. The atomic nuclei collide with incredible energy in the heart of the reactor. "We constantly have around 50 doctoral students here, almost all of whom are working to develop new tools for measuring or controlling the plasma," explains Deputy Director Yves Martin. This work is now contributing to the development of ITER, an international project that SPC is a member of. In the fusion power stations of the future, the heat generated in the fusion reactions will drive turbines to produce large quantities of sustainable energy without creating greenhouse gases or long-lasting radioactive waste.

Climate strikes had measurable effects

A study conducted by the Laboratory for Human-Environment Relations in Urban Systems (HERUS) at EPFL found that the environmental movement inspired by Greta Thunberg has helped to change the behaviour of individuals in Switzerland. The survey, carried out in 2019 by postdoctoral researcher Livia Fritz, discovered that almost 30% of those surveyed switched to more environmentally friendly habits due to the movement led by Thunberg. The changes observed covered transport (less flying and more sustainable mobility), consumption (more local, organic and plant-based products) and recycling. "This shows a true awareness of environmental behaviour and a substantial transformation process at individual level," says the researcher.

Read more.

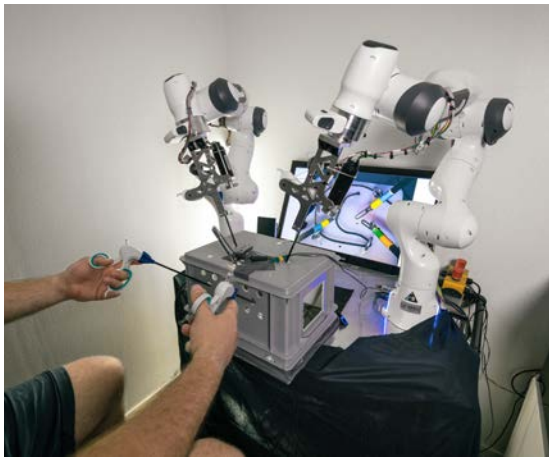
Four arms = more precise surgery

Robotics researchers at EPFL have made a huge breakthrough in laparoscopic surgery by creating a system that lets a surgeon operate multiple systems with several limbs, thus achieving greater overall control. Specialists have already been successfully trained in the use of the system, and have performed clinical tests in Geneva. Each of the user's hands controls a manipulation instrument, while one foot controls the camera or endoscope and the other operates a motorised forceps. The latter are capable of haptic feedback to guide the instrument to its target. "The combination of foot-controlled robot assistants and joint control strategies reduces the mental and physical stress on surgeons, while proving our hypothesis that surgical results could be improved," explains Professor Aude Billard, who co-authored the project together with Professor Mohamed Bouri.

Conducting lightning bolts with laser beams

A novel lightning conductor was recently tested successfully at the summit of the Säntis mountain in Switzerland. The Laser Lightning Rod (LLR), developed by a European consortium from the University of Geneva (UNIGE), the École Polytechnique (Paris), EPFL, the School of Economics and Engineering of the Canton of Vaud (HEIG-VD), and TRUMPF scientific lasers (Munich), proved its effectiveness in conducting lightning strikes from several dozen metres of range. Researchers at EPFL, led by Farhad Rachidi and together with HEIG-VD, investigated the initiation of rising lightning discharges and used test equipment to observe the strikes. The next step will be to further increase the effective range of the laser, which also works through clouds. The goal is to extend a 10-metre-high lightning conductor by 500 metres using the LLR.

Scan this QR code to watch a video of the robot-assisted surgery on YouTube.

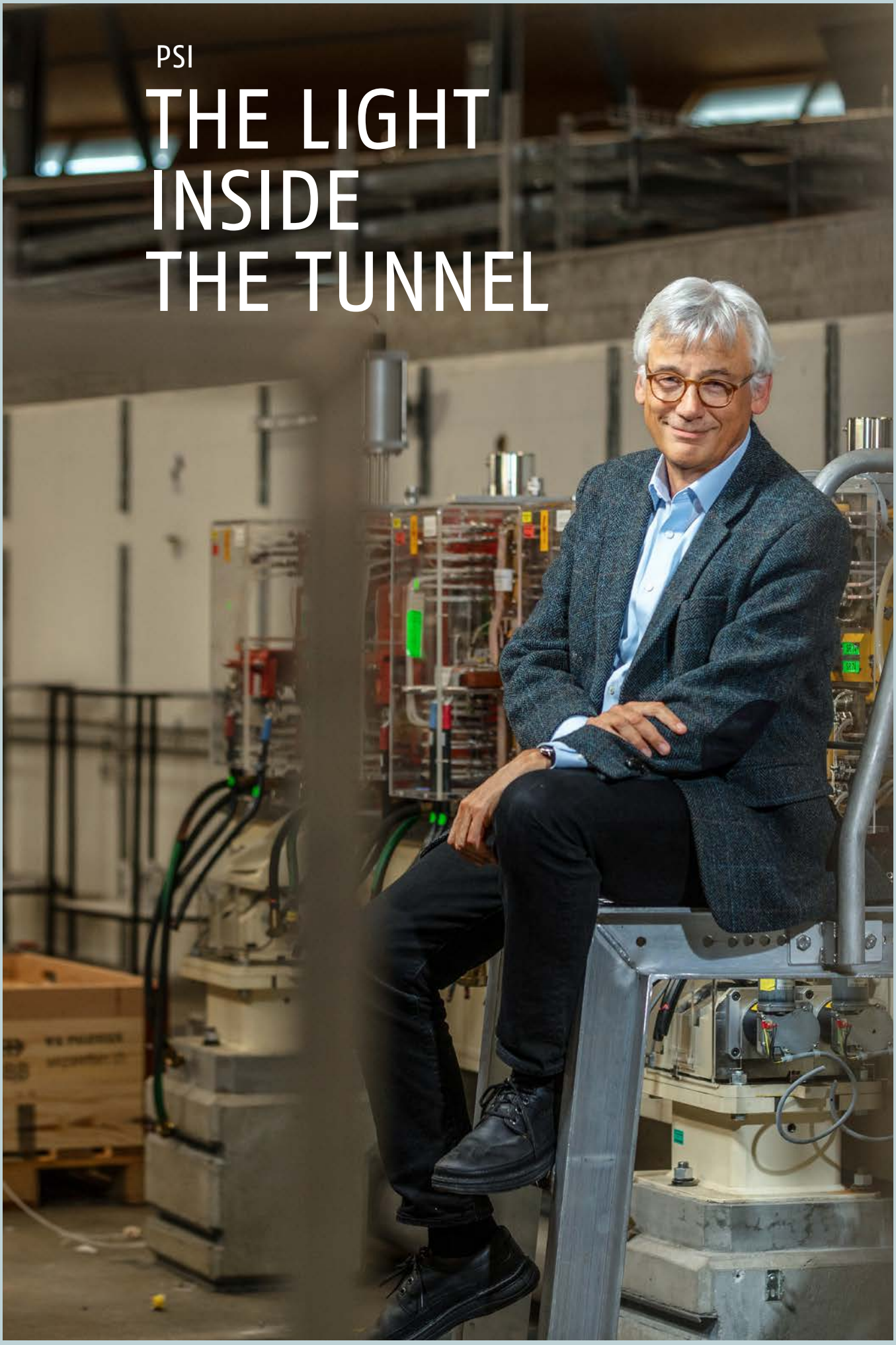


The results, published in the *International Journal of Robotics Research*, prove the feasibility of the system.
› EPFL

› Photo (left): M. Stollberg/EPFL/Trumpf

PSI

THE LIGHT INSIDE THE TUNNEL



The Swiss Light Source at the PSI is currently undergoing an upgrade to ensure that it remains a centre of excellent research in the future. The project manager gave us a tour of the construction site.

Usually not accessible: Hans-Heinrich Braun (pictured) in the ring at the Swiss Light Source, where disassembly is in full swing.

These are "dark" times at the PSI in Villigen. But to stretch the metaphor a little further, you can already see the light at the end of the tunnel – or rather, inside the tunnel. We are welcomed by Hans-Heinrich Braun, project manager of "SLS 2.0", who takes us to the most expressive building at the PSI. For a good 20 years now, a huge, round "UFO" has stood at the southern end of the complex. Its dimensions match the ring that is at the heart of the facility. Electrons travel through this ring – the Swiss Light source, or SLS for short – at almost the speed of light. Or at least they normally would.

Only around 400 days to go before the dark days at the SLS are over and electrons generate synchrotron light again.

During our visit in October 2023, the only things moving in the building are two massive industrial cranes. Braun points to one of them: "We had it specially installed to complete the conversion." Things have to move quickly, which is why a lot of things overlap at the moment; in fact, construction and dismantling are happening at the same time. From an elevated walkway, with the best view down onto the facility, Braun explains what is happening: equipment is being diligently dismantled and removed, bolted and installed. A section of the new synchrotron, a thin copper tube in a metal frame, is already in place on one side. Everything at the SLS is currently being changed. The facility will ultimately be shut down for 15 months, a long time considering the many experiments running simultaneously here before: 16 "beamlines" branch off from the ring to the experimental stations, which are distributed around the hall – primarily for various x-ray spectroscopy studies. The method lends itself to analyses of new materials as well as the study of protein crystals.

Industrial partners like to use the facility for the latter in particular. The PSI works closely with pharmaceutical companies, and the methods used are currently the gold standard for unravelling complex protein structures. In this respect, the PSI is more of a service provider than a basic research institute. Can the partners be expected to be kept waiting this long? In other words, given the competition with other synchrotron facilities, isn't a shutdown of this kind problematic? Braun disagrees, saying not doing the conversion would be a problem. "Top researchers go to the best facilities." And after 20 years of successful operation, without a comprehensive update, there is a risk of falling behind with technical developments.

He adds that it was a stroke of luck that the synchrotron facility in Grenoble, the European Synchrotron Radiation Facility (ESRF), had also just been modernised, "so it was a bit of a trade-off." Some experiments were moved to Villigen during the ESRF's shutdown, and now researchers can do their work in Grenoble. Of course, the aim is to bring the top people back to the PSI, which is exactly what the conversion is all about. You can see and hear the anticipation when Braun talks about the new facility that is being built down below. According to Braun, after the conversion, much more intensive beamlines will be available, which will render experiments feasible that "would have taken years to complete" with the current equipment. However, this also means that the synchrotron's technology will be considerably more complex. Some of the challenges have been solved in the PSI's own workshop, where prototypes for the state-of-the-art magnetic tube have been in development for some time. According to Braun, this gives the PSI a significant advantage when dealing with the companies entrusted with manufacturing, enabling it to negotiate "as equal partners." After all, this often involves "procedures not found in any textbook." The requirements for such a facility – the precision, the ultra-high vacuum allowing the electrons to have a free path – are similar to those found only in the production of computer chips.

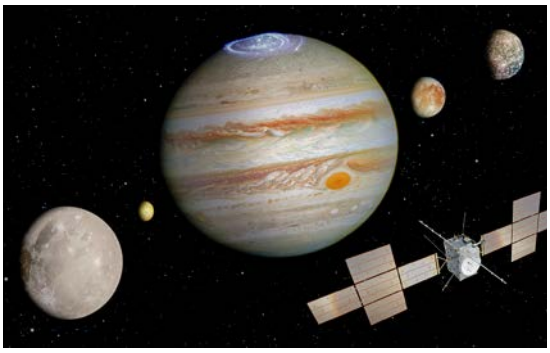
Braun oversaw the construction of the SwissFEL, where he learned not to lose sight of any detail, such as the processing of the volumes of data generated, which occasionally caused a bottleneck at the SwissFEL. As he sees it, this is the real challenge with such a large-scale project: all the different aspects that have to dovetail perfectly in the end.

When you have all this explained to you, you begin to develop a growing respect for this monumental undertaking. And even if everything in the hall seems calm and focussed, you can imagine the pressure you are under when designing instruments that will open up new opportunities for the next generation of researchers: "We want to push the boundaries of what is possible – we want to explore the extreme." Only around 400 days to go before the "dark" times are over.

RADEM helping on board the mission to Jupiter

Find out about JUICE online.

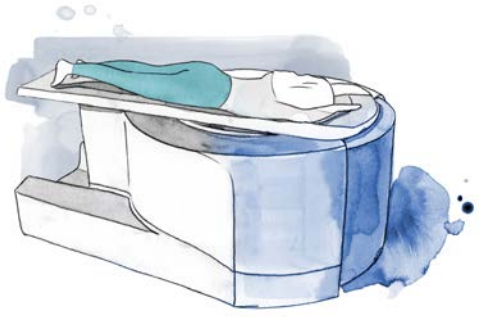
The ESA mission JUICE (Jupiter Icy Moons Explorer) blasted off on 14 April 2023 on its journey to explore the three largest moons of Jupiter. The mission will investigate how the Jupiter system was created and look for evidence of oceans beneath the layers of ice that could support extraterrestrial life. One of the many instruments on board is the RADEM, a radiation-resistant electron monitor developed at PSI. It will provide information about the complex radiation conditions and highly dynamic magnetic environment in the Jupiter system. RADEM also acts as a protective system: if it detects dangerous radiation levels, the other more sensitive instruments on the JUICE mission can be switched off and protected.



Artistic representation of the JUICE mission to explore.
› ESA/ATG medialab

Early breast cancer detection with phase contrast

A newly developed process called grating-coupled interferometry could improve early detection of breast cancer in the future. Researchers at PSI are working on the technology together with teams from ETH Zurich, Kantonsspital Baden and the University Hospital of Zurich. The system is based on computer tomography, which uses x-rays to scan breast tissue, but the new method also uses the information from the phase of the x-ray light waves. These are signals that are created when the rays refract and scatter on the tissue. This information can be accessed by passing the x-ray light through three additional optical gratings. Compared to conventional x-rays, the new system produces images with much better re-solution and contrast at the same radiation load, making it easier to identify even the smallest changes in tissue.



Researchers are further developing the fluoroscopy procedure for the early detection of breast cancer so that results are considerably more reliable while the procedure itself is less unpleasant for the patient.
› Julia Ossko

Is carbon-neutral flight possible?

Researchers at PSI and ETH Zurich have calculated how air travel can become carbon neutral by 2050. They discovered that in addition to switching to synthetic sustainable fuels, achieving this goal will require underground carbon dioxide storage and a reduction in air travel. The researchers' study also looked at what are known as non-CO_2 effects, which include things like vapour trails and cirrus clouds that form in the upper atmosphere due to emissions from aircraft. The effects are comparatively short-lived, but are currently responsible for much of the damage to the climate caused by growing air travel. A reduction in air travel would cause these non-CO_2 effects to quickly disappear, however. Reducing air travel by just 0.2% per year, combined with a gradual switch to more environmentally friendly fuels based on renewable energy, would prevent aviation from damaging the climate any further by 2050.

WSL

"FORESTS ARE COMPLEX SYSTEMS"

Remote sensing specialist Petra D'Odorico likes to fly drones. Not as a hobby, but rather to record high-resolution multispectral and thermal images, which can be used to create an early warning system to detect drought stress in forests before it becomes apparent.

A walk on late summer's day. Sitting on a bench at the edge of the forest, enjoying the sunshine and the stillness. The only sound is a tractor rumbling in the distance, with barely a rustle from the undergrowth. Suddenly, a high-pitched buzz – quiet at first, then increasingly loud. Looking up solves the mystery: it's a drone. But what is it doing here? Maybe it is performing scientific research, investigating the forest from above. After all, forest experts have long appreciated just how useful these flying wonders are for their research, helping them get a literal overview of the effects of drought, for example. All you need are the right "eyes".

Spectra can make many things visible, from biochemical and morphological features to the trees' behavioural traits.

Petra D'Odorico's drones use sensors that cover many wavelengths beyond just visible light. Using an expanded and higher-resolution spectrum can reveal something that a forest ranger would only notice much later: drought stress. After long periods of dryness, leaves activate a special protective mechanism that ensures that the light absorbed is "channelled" differently than via photosynthesis. Photosynthesis only works if there is enough moisture, as it uses H_2O for biochemical processes. The protection mechanism changes the leaves' pigments. "A bit like what happens in autumn," explains D'Odorico as the phenomenon appears on the images. Too subtle for the human eye, this change in the composition of leaf pigments and then in the spectrum only becomes clear on the computer screen. It's a surefire warning signal of stress.

Another major advantage of the airborne images is the ability to simultaneously scan thousands of trees. This would be much harder to do at ground level. D'Odorico explains how she used to work mainly with satellite images, but she wanted to zoom in further. It wasn't until she started using the drones that she gained the spatial resolution needed to study forest processes in individual trees. This is because not all trees and tree species react to stress in the same way. She can also select the temporal resolution to fit her needs, while satellites can only orbit on a fixed schedule. This lets her zoom in during a heatwave, for example.

Data from drones makes it possible to select a portfolio of tree species that will help Swiss forests in the future.

D'Odorico is happy to show us the "tools of the trade" in a basement room of the WSL in Birmensdorf. But these specimens are larger than the drones that we are familiar with in everyday life, as they are expensive versions for professional use. As a result, handling the drones is more dangerous than one would imagine. "You should never fly one of these drones alone," says D'Odorico. Special software makes planning flights over a predefined area easier and the scanning manoeuvres are mostly performed automatically, but the drones have to be operated manually during takeoff and landing as well as for special shots. This commands a certain degree of respect: "We are taking pretty expensive sensors around 100 metres up in the air." The person flying the drone therefore needs to know what they are doing. That is why D'Odorico received flight training from a former US army pilot in Canada.

She explains how drone images and digital analysis have long been used in agriculture to assess the yield capacity and stress resistance of crop plants. "Forests are more complex systems, however." With this in mind, D'Odorico's work still involves a large amount of basic research. The main aim is to understand everything that can be seen on the images. Spectra contain lots of information that is often difficult to interpret, ranging from biochemical and morphological features to the trees' behavioural traits. For this reason, she emphasises the continued need for human observation and knowledge of the forest. "We are not yet at the point where we can do everything with drones." Forest ecosystems are simply too complex for that. Currently, D'Odorico is focussing on sorting the mass of data and validating it together with the experts on site: "The forest rangers' knowledge is still essential."

The data from the drones provides a much broader picture, however. For example, the images can be used to study which tree species are better equipped to handle warmer, drier climates. The information can allow us to select a portfolio of tree species that will help Swiss forests in the future. The value of this forest knowledge is obvious, particularly given the reality of a changing climate.

Hope for ash trees

Dieback is proving devastating for ash trees, which were once Switzerland's second most common deciduous tree. Over 90% of the trees have suffered, with young trees in particular dying off in large numbers. This is due to a fungus from Asia that causes the trees' shoots to wither away. The trees are also threatened by the emerald ash borer, an invasive species of beetle that is also from Asia and is spreading across Europe. The beetles' larvae that grow inside the trees are deadly to the ash. But there is also some reason for hope – trees that are resilient to the fungus are also more resistant to the beetle. Researchers from WSL have proven this in a study. The resistant ash trees produce defensive substances against the fungus that also have a negative effect on the larvae's growth. The task now is to plant as many of these cross-resistant ash trees as possible in our forests to ensure the species' survival.

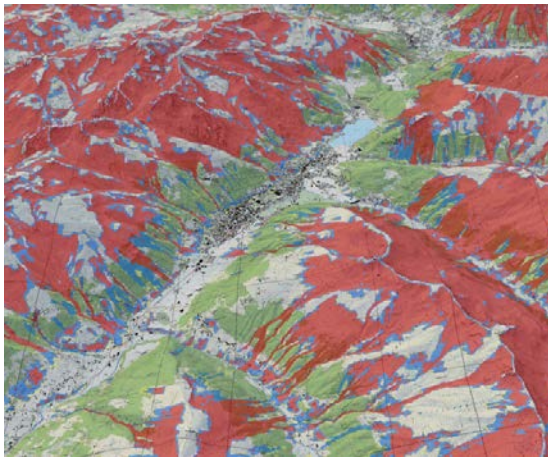
An experiment on ash trees in the tree protection laboratory at WSL.
› Michael Eisenring/WSL

Plastic-eating microbes found in the Alps and Arctic soils

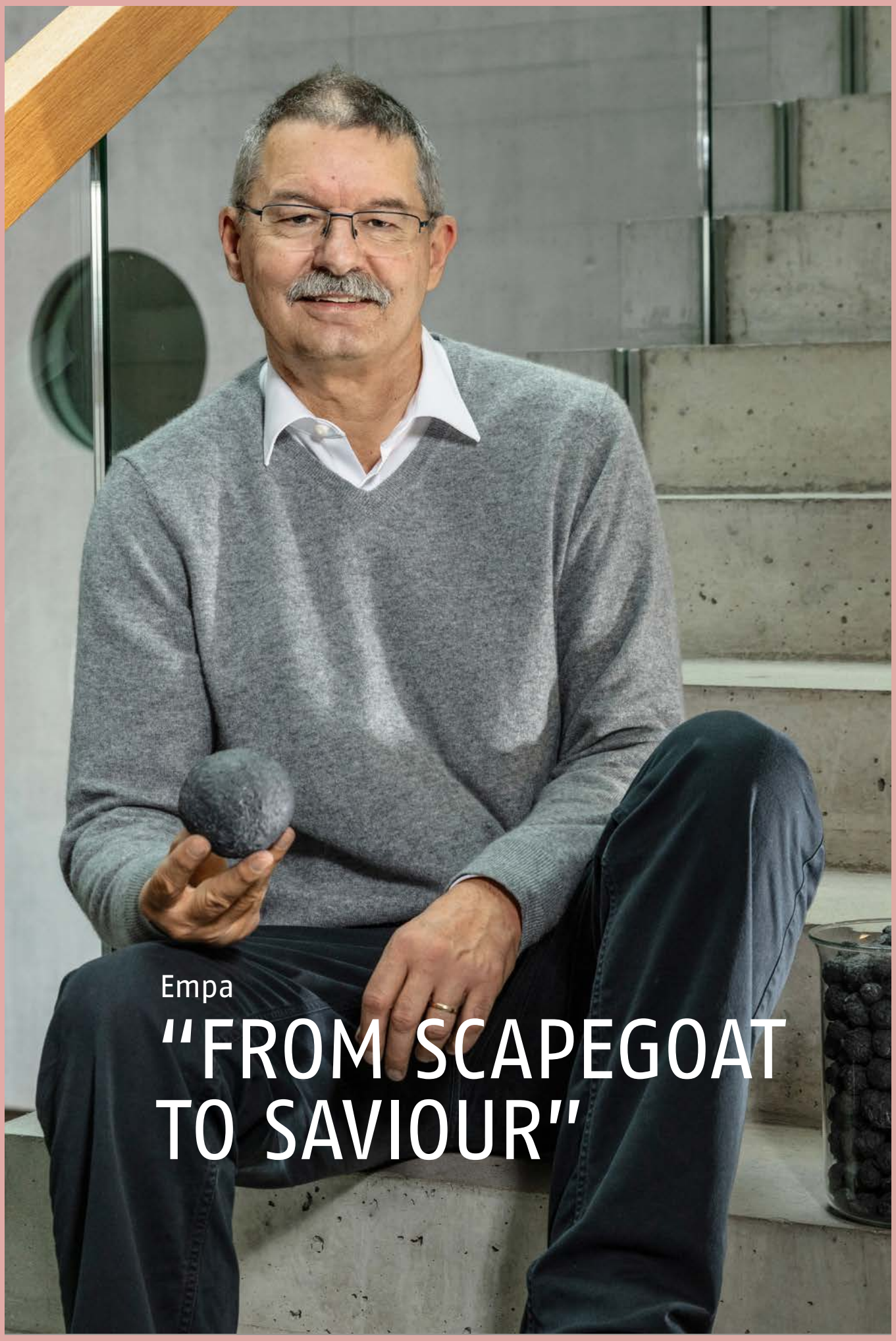
Microorganisms could help pave the way to a circular economy for plastics. Some types of microorganisms produce enzymes that accelerate the decomposition of plastics into small, reusable components. For use in industry, however, the enzymes of currently known microorganisms require temperatures above 30°C, which is both costly and energy intensive. However, researchers at WSL have now found microbes in the Alps, Greenland and on the Norwegian archipelago of Svalbard that can decompose certain types of plastic at temperatures as low as 15°C. They identified a total of 19 strains of bacteria and fungi that could decompose biodegradable plastic with the exception of polyethylene (PE). The researchers now want to identify the enzymes produced by the microbes and optimise the process to produce them in greater quantities. These insights will then be applied to the recycling of biodegradable plastics.

Automatically mapping avalanche risks

Maps that show areas at risk of avalanches are complex to create, which is why they are almost only made for settled areas. Researchers at SLF have now fully mapped out the avalanche risk in Switzerland's Graubünden canton using the simulation software RAMMS. Comparing areas on the automatically generated maps to those on the conventional maps has shown that the new method delivers reliable results. The approach can also be applied to other areas, provided that precise terrain models and information on snowfall are available. Researchers have now generated hazard maps for the Valais and Ticino cantons, as well as for areas in Italy, Alaska, New Zealand, Georgia and Afghanistan.



Automatically generated hazard map for the area around Davos.
› SLF



Empa

"FROM SCAPEGOAT TO SAVIOUR"

What role can the construction industry play in combating ever-worsening climate change? Peter Richner thinks it can be a game changer. We speak to the Deputy Director of Empa and Co-Head of the Sustainable Construction research focus area.

Mr Richner, you want to use the atmosphere as a source of CO_2, a process you call "mining the atmosphere". How would this actually work? The thing we have to make clear first of all is that, as hard as reaching our target of net zero by 2050 is, it is only one step on our journey. After 2050, we have to achieve negative emissions to an extremely high degree, otherwise our efforts will be for nothing.

Negative? Is reducing CO_2 emissions beyond zero even possible? Yes, it is possible. The way to do this is by recovering a significant proportion of the emitted CO_2 from the atmosphere.

What is the difference between your approach and that of carbon capture and storage (CSS), which has proven so controversial? It goes without saying that I am obviously in favour of anything that would minimise CO_2 emissions. The problem with CCS in my view, however, is that it does not create any value. The process of storing CO_2 from the atmosphere in the ground only generates costs. Our approach starts from a similar place, but we aim to find a way to use the captured carbon. You could call it CCU: carbon capture and use.

Use? How exactly could you use all that carbon? That is the big question. Who would have a use for such massive amounts of carbon? Not as fuel, but as a material. The first answer that springs to mind is the construction sector. We are not talking about a few thousand tons here, but hundreds of millions.

And the carbon could be used here? Could we build houses out of carbon? Not quite, but something along those lines. We have developed a type of lightweight concrete that is mixed with carbon pellets. It's not high-performance concrete, but it is sufficient for most uses. This provides a sink in which the CO_2 is permanently retained.

But doesn't producing concrete also generate lots of CO_2? We can actually achieve carbon-neutral concrete production with the materials available today, but we believe that we will be able to generate minus 100 kg CO_2 / m^3 or even less in future. And all of a sudden, that means the more concrete we produce, the better it is for the environment. This opens up whole new opportunities, particularly when you look at the development of the construction sector from a global perspective. Just think of all the construction and infrastructure projects in China, or all of the countries that have virtually no infrastructure at all.

But where will this carbon be produced? And where will the energy come from? That is the second big issue. We won't make it here, but rather wherever there is a lot of energy available. The assumption I am about to make may be slightly controversial, but I believe that we will one day reach the point where we have plentiful renewable energy. Oil-producing nations know that the days of making easy money from fossil fuels are numbered, but they still want to be big players in energy supply in the future. That is why they are investing massively in solar power.

Hang on, that sounds strange. You want to use solar energy to make carbon? Not directly. We can use electricity to create hydrogen, which we then use to turn CO_2 into methane. We then transport this methane as a liquefied gas to where it is needed. This will allow us to import renewable energy to Switzerland. There will definitely be demand for this, especially in winter. The important thing is how you turn the methane into carbon. This process is called pyrolysis and it releases hydrogen while generating carbon as a byproduct. Since carbon has the highest carbon dioxide density of any material, this is extremely practical.

Is concrete the only suitable reservoir for this carbon? We are currently looking into other possibilities. Asphalt could be highly suitable, for example, as could insulation material. There is plenty of room for development.

There have been other suggestions of how to make the construction sector a sink for CO_2. The German climate expert Hans Joachim Schellnhuber is championing wood, for example. Is that not more efficient? Using wood in construction certainly makes a lot of sense in areas where it is plentiful. However, once the wood has reached the end of its useful life, you can't just burn it, otherwise you generate more CO_2. We have to remove carbon from the cycle for several centuries, not just 50 years.

Speaking of time, houses don't last forever either. What happens in the event of demolition? We have to rethink things here as well. We need a "design for disassembly". This means that the carbon stays in circulation for a few cycles and the components can be reused in new buildings. Afterwards, they would then be placed in a mineral landfill, which would create a final sink.

This all sounds good in theory, but politics always plays a role. How can we get this technology off the ground in a big way? We will need a gradual approach – this could mean pyrolysing organic material into carbon at first. What is clear is that CO_2 emissions must have a price, and those doing the emitting must pay. But in turn, this means those who build can get money back. It's all about creating the right incentives. We absolutely have to create solutions that can be accepted by a majority of the population.

Now you really sound like a politician. Do you see this research work as a kind of social engagement? Absolutely. I understand the challenges, but we want to highlight the solutions that can really work instead of just saying, "Oh no, all is lost." We have been pumping out emissions for free for around 200 years, which has created an enormous debt burden for our civilisation. Our job now is to put this right.

New nanomaterials enable gentler treatment of tumours

Read more.

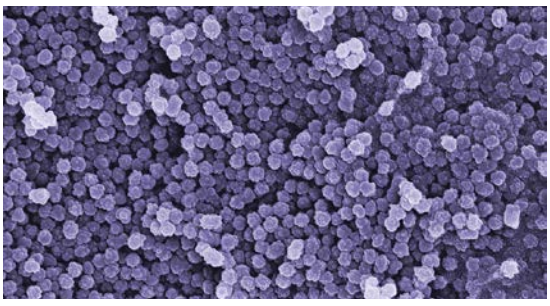
Empa researchers are developing novel radiosensitizers from metal-organic compounds to make cancer therapy more efficient.
› Empa

Radiotherapy is one of the cornerstones of cancer treatment, but some types of tumour barely respond to it. To make tumour cells more sensitive, researchers at Empa are working together with the University Hospital of Zurich, the Kantonsspital St. Gallen, the Paul Scherrer Institute (PSI) and ETH Zurich to make what they call radiosensitizers using nanomaterials. Among the promising candidates are metal-organic frameworks (MOFs) and two-dimensional metal compounds known as MXenes. Laboratory experiments have shown that the radiosensitizers greatly increase the effect of radiation on tumour cells while leaving healthy cells undamaged. This precision radiotherapy is making cancer treatment more effective and gentler on the surrounding tissue.

Investigating microplastic pollution in Swiss waters

Read more.

Every year in Switzerland, around 14,000 tonnes of plastic flows into the environment. A portion of this is made up of microplastics from cosmetics or artificial clothing fibres. Countless tonnes of this material ends up in rivers and lakes. However, we still do not have an accurate overall picture of this pollution. That is why Empa researchers have developed a model that shows what happens to the seven most widespread plastics in Swiss waters. The results showed that around half of the material stays in the ground, while a third ends up in lakes and the rest in rivers. Areas downstream from major cities, such as in the Rhine near Basel, are particularly badly affected. Around 4.5 tonnes of plastic are carried down the river to Germany every year.



Microplastic particles like polystyrol (here under 50,000x magnification) are small enough to easily end up in bodies of water.
› Empa/ETH Zurich

Accelerating battery research with robots and start-ups

Empa researchers are working to speed up development of urgently needed batteries using the robot Aurora. The project is part of the Battery2030+ research initiative that recently received over EUR 150 million in funding from the EU. The aim is for Aurora to choose materials and assemble and analyse battery cells fully automatically – in the future using AI. This will make the development process around 10 times faster for all types of batteries. Meanwhile, the Empa spin-off BTRY is working on completely new thin-film batteries. These are safer and have a longer service life than conventional lithiumion batteries. They are also much more environmentally friendly to produce and can be charged and discharged in just one minute. Although it was only founded in August 2023, the start-up has already achieved some impressive successes, including obtaining financing from Innosuisse, the Empa Entrepreneur Fellowship and inclusion in the Business Incubator of the European Space Agency (ESA).

Watch the livestream with BTRY Co-Founder Abdessalem Aribia.

EAWAG

ALL THAT'S LEFT BEHIND

Wastewater-based epidemiology can provide valuable insights into a population's overall health. By analysing samples gleaned from wastewater, Eawag is helping medical experts shed new light on the prevalence of coronavirus infections during the pandemic. But the possibilities don't end there.

To archaeologists, a bit of rubbish can be a gold mine. The smallest shard of pottery, piece of bone or scrap of leftover food can tell us a great deal about everyday life in a society. It's a similar story with wastewater. In that sense, you might describe the work being done by Christoph Ort and Tim Julian as that of archaeologists on a modern-day dig. By analysing what people leave behind, they can find out more about what's happening to society in the here and now.

Their method began life as a way to identify drug residues in wastewater. Ort was able to show how effective wastewater analyses could be in supporting national drug monitoring programmes. However, the method really gained traction during the COVID-19 pandemic, since viral genetic material can also be identified by analysing traces in wastewater. Just like drug residue, this material is excreted into the toilet and eventually ends up in sewage treatment plants. "Wastewater is extremely valuable," says Julian, who founded the "Pathogens and Human Health" research group at Eawag a decade ago. "It's a treasure trove of health data." And this wealth of information is just waiting to be analysed.

Eawag researchers led by Tim Julian (left) and Christoph Ort analyse hundreds of wastewater samples for SARS-CoV-2 and other respiratory pathogens every month.

The project is being supported by the Federal Office of Public Health and remains topical even in a post-pandemic world because while the coronavirus may have all but disappeared from public consciousness, it is still an issue for sewage treatment plants. "Switzerland is a country that still monitors its wastewater for traces of coronavirus even though the pandemic is over," explains Ort, an environmental scientist. The value of these methods is not lost on the public authorities; at the height of the pandemic, wastewater from up to 100 sewage treatment plants was being analysed. The scope has narrowed since then, with 14 plants currently being monitored. The plants have automated processes for taking routine water samples, some of which are sent to Dübendorf to be analysed in the Eawag laboratory. Alongside COVID-19, the monitoring process covers a range of other infectious diseases, including influenza, RSV and MRSA bacteria, which are resistant to some antibiotics. Searching for pathogens in the environment as well as in hospitals is not a new concept, says Julian, a microbiologist. In fact, people have been talking about the idea of "environmental surveillance" for quite some time. However, to monitor the environment like that, you need to find the right spot to position your sensors. Experts have been championing the establishment of wastewater-based epidemiology for over a decade. The method has long been on the periphery, Ort adds, but now that it has proven just how useful it can be, the breakthrough may have come at last.

Virus monitoring provides access to a second source of data, allowing experts to keep track of the viral load away from the clinical environment. This method is also independent of current test procedures, which have a major influence on the data available from hospitals, testing centres and doctors' surgeries. In these scenarios, the more tests that are carried out, the more infections are identified – and vice versa. Wastewater presents a more "neutral" option. The close collaboration with researchers at ETH Zurich and EPFL has made it possible not only to determine the viral load, but also to track the development of variants. So, with the sensors now in place, the question is: Would it be feasible to establish a kind of early warning system, using wastewater analyses to track the progression of certain diseases before they become an issue for the healthcare sector? "In theory, yes," says Julian, "there are ways to sequence large amounts of unknown DNA." But these are highly complex processes, so it's still too early to say how this would work in practice.

That said, what we can do now is establish connections between virological and pharmacological analyses. It's not just drugs and viruses that can be tracked in wastewater; we can also detect cough syrup and histamine blockers that are linked to allergies. This opens up an array of new perspectives in terms of public health. It essentially allows us to track symptoms in real time across the population and establish correlations that might otherwise have gone undetected.Demand for these kinds of data is growing. However, Ort also stresses the importance of ensuring that the information obtained is "handled with care".

Since February 2021 the extracts have been stored at -80°C, as seen here, so that the samples can also be analysed for other pathogens of public health importance in the future.

Keeping cities cool with satellite images

As cities become ever denser and busier, blue-green infrastructure aims to minimise the increasing heat. But it takes time for new green areas, trees, ponds, fountains and other measures to have a measurable effect. A team from Eawag is now using information from satellite images and sensors for the first time to determine this time period. Trees and climbing plants, for example, can take between seven and ten years to make a significant and measurable difference to surface temperatures. Grassy areas or artificially watered systems are much faster, taking just one to three years.

Documenting biodiversity among Swiss freshwater fish

Just two centimetres: that's how long the smallest stickleback recorded by Eawag researchers in the Progetto Fiumi project measured. At the other end of the scale was a 140-centimetre wels catfish from the Rhine. This range of sizes is testimony to the enormous biodiversity among fish in Switzerland's rivers. Over a period of five years, researchers collaborated with fishing inspectors, fish farmers, staff from environmental bodies and volunteers to take fish from rivers and streams at 324 sites across Switzerland, from lowland areas to over 2,200 metres above sea level. Over 20,000 fish of over 50 species were caught, with 12,000 DNA samples and over 5,000 scale samples taken for further research. These insights will help advisers, public authorities, politicians and the scientific community make the right decisions when it comes to managing the ecosystems and maintaining this biodiversity.

Motivating people to use decentralised water purification

Around a fifth of the world's population has no access to clean drinking water. Decentralised technologies would make it possible to purify and supply water where it is needed at low cost. However, encouraging people to use these technologies often requires a number of measures. Researchers from Eawag have summarised the current insights into the psychological factors that influence the use of decentralised water purification systems and which measures could help spread them further. This information will help NGOs, public authorities and industrial specialists to plan the right supportive and promotional measures.

Scan here for the full interview.

Click here for the final report "Progetto Fiumi".

The decentralised water purification facility (right) processes urine for fertilisers and water for handwashing
› Luca Barausse/Eawag

› Photo (left): Michel Rogg

GOVERNANCE

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Legal basis and structure of the ETH Domain

The Federal Government operates the Federal Institutes of Technology in accordance with the Federal Constitution (Art. 63*a* para. 1). The Federal Act on the Federal Institutes of Technology (ETH Act) defines this mission as this law governs the ETH Domain. Together with Art. 64 para. 3 of the Federal Constitution, it also forms the legal foundation for operating the four research institutes of the ETH Domain and for the ETH Board as the strategic governing and supervisory body of the ETH Domain.

The ETH Act defines the status, structure and mission of the ETH Domain. The ETH Domain is autonomous within the framework of the law. The ETH Act also defines the autonomy of the two Federal Institutes of Technology and the four research institutes. The ETH Domain is allocated to the Federal Department of Economic Affairs, Education and Research (EAER).

Tasks
According to the purpose set out in Art. 2 ETH Act, both Federal Institutes of Technology and the four research institutes (institutions of the ETH Domain) must educate students and specialists in scientific and technical fields and ensure continuing education, expand scientific knowledge through research, foster the development of junior scientific staff, provide scientific and technical services, perform public relations work, and make use of their research results. The institutions of the ETH Domain discharge their mission in observance of internationally recognised standards. They take account of Switzerland's needs and promote national as well as international cooperation.

Strategic objectives and expenditure ceiling
The political leadership of the ETH Domain rests with the Federal Council and the Federal Parliament. The central leadership tools are the Dispatch on the Promotion of Education, Research and Innovation (ERI Dispatch) and the associated strategic objectives set by the Federal Council for the ETH Domain. The political tools are supplemented by the ETH Board's strategic controlling, which provides information on financial reporting and mission fulfilment. In accordance with Art. 34*b* ETH Act, the Federal Assembly determines an expenditure ceiling for each four-year period to cover the operational and investment needs of the ETH Domain. The Federal Assembly then decides on the annual financial contribution with the budget.

Reporting
The ETH Board reports annually to the Federal Council and shows the degree to which the strategic objectives have been met and how the ETH Domain has used the total federal contribution. The Federal Council, in turn, reports to Parliament on the achievement of the strategic objectives, drawing on the ETH Board's reporting, among other things. In each half of the Promotion of Education, Research and Innovation Policy (ERI) period, the ETH Board compiles a self-evaluation report that comments on issues specified by the competent Federal Councillor. This self-evaluation report serves as the basis for the evaluation of the ETH Domain by a group of international experts (peer review), which is to be carried out by the Federal Department of EAER. The last evaluation took place in the reporting year.

Discussions are held twice a year between the proprietor, represented by the EAER and the Federal Department of Finance (FDF), and the ETH Board, represented by its President.

Managing and supervisory body ETH Board: mission and operating principles
The ETH Board is responsible for the strategic leadership of the ETH Domain, it defines the strategy of the ETH Domain within the framework of the strategic objectives of the Federal Council, represents the ETH Domain when dealing with policymakers and government authorities at the federal level, issues directives about financial controlling, and carries out strategic controlling. It also approves the development plans of the institutions of the ETH Domain, oversees their implementation and supervises the ETH Domain (Art.

25 ETH Act). It agrees on targets with the institutions and allocates federal funds, specifically on the basis of the institutions' budget requests (Art. 33*a* ETH Act). It submits requests to the Federal Council for the election or re-election of the Presidents of the two Federal Institutes of Technology and of the Directors of the four research institutes (Art. 28 para. 1 and 7 ETH Act). It also appoints the other members of the Executive Boards of the two Federal Institutes of Technology and of the Directorates of the four research institutes (Art. 28 para. 4 and 7 ETH Act). Finally, the ETH Board appoints professors at the request of the Presidents of both Federal Institutes of Technology (Art. 14 para. 2 and 3 ETH Act).

The Executive Boards of both Federal Institutes and the Directorates of the four research institutes are responsible for the operational leadership of the individual institutions of the ETH Domain. In accordance with Art. 4 para. 3 of the ETH Act, the institutions of the ETH Domain assume all responsibilities that are not expressly assigned to the ETH Board by the ETH Act.

The rules of procedure of the ETH Board are published in the Official Compilation of Federal Legislation. The ETH Board usually meets five times a year for two days at a time, and arranges additional meeting days for dialogues with the institutions of the ETH Domain. The President of the ETH Board is responsible for holding periodic individual discussions with the Presidents of the two Federal Institutes of Technology and with the Directors of the research institutes.

The ETH Board performs its supervisory function through the use of the following tools: periodic reporting by the institutions on resources (finances, personnel, real estate), annual reporting by the institutions on the extent to which they have fulfilled their duties with regard to target agreements, annual discussions (known as dialogues) between the ETH Board and the institutions of the ETH Domain within the scope of strategic controlling, handling supervisory complaints addressed to it while observing subsidiarity and institutional autonomy, as well as reports by the institutions within the scope of their risk management systems. Moreover, the ETH Board's Internal Audit department evaluates the risk management processes, internal control system (ICS) and governance processes of the institutions and reports on them to the ETH Board.

[1] https://www.efv.admin.ch/efv/en/home/themen/finanzpolitik_grundlagen/cgov/grundlagen.html

Structure of the ETH Domain

* Employment contracts incl. doctoral students, as of: 31 December 2023.

ETH Domain

ETH Board
11 members
57 employees (staff, Internal Audit, Appeals Commission)

Federal Institutes of Technology

ETH Zurich
24,540 students and doctoral students
13,850 employees*

EPFL
12,576 students and doctoral students
6,521 employees*

Research institutes

PSI
2,220
employees*

WSL
648
employees*

Empa
1,058
employees*

Eawag
536
employees*

Vested interests and awareness-raising activities

In keeping with expectations for good governance, vested interests are regulated extensively[1]: Art. 24*c* ETH Act; Art. 2*a* and 7*a* Ordinance on the ETH Domain; Art. 11, 13, 14 Management Salaries Ordinance; Corporate Governance Guideline 6 of the Federal Council for autonomous entities of the Federal Government[2]; the ETH Board's guidelines on secondary employment of members of the Executive Boards of the Federal Institutes of Technology and of the Directorates of the research institutes; the ETH Board's directives on secondary employment of professors in the ETH Domain; Art. 6 ETH Ordinance Concerning Professors; Art. 56*a* Personnel Ordinance for the ETH Domain (PersO-FIT); and the guidelines of the two Federal Institutes of Technology on conflicts of interest and secondary employment. The legal requirements are consistently implemented by the ETH Board within its area of responsibility: all vested interests and secondary employment of members of the ETH Board and of members of the Executive Boards and Directorates of the ETH Domain's institutions are examined once a year by the Audit Committee and then approved by the ETH Board – subject to the proviso that the Federal Council is responsible – provided that the requirements are met in accordance with the applicable legal basis.

New vested interests and secondary employment are reported to the ETH Board during the year on an ongoing basis and examined to ensure compliance with the provisions of the Management Salaries Ordinance (no reputational risks or conflicts of interest; maximum workload of 10% of a workload; surrender of the part of the income from secondary employment that exceeds 30% of the salary). In addition, the secondary employment of members of the ETH Board and the Directors of the research institutes is published on the websites of the Swiss Confederation[3] and the ETH Board[4]; the institutions are responsible for publishing the secondary employment of members of the Executive Board and of the institutions' Boards of Directors. The Swiss Federal Audit Office (SFAO) states in its report (SFAO-22472) on the cross-sectional audit of secondary employment focussing on conflicts of interest ETH Board, ETH Zurich, EPFL, PSI, WSL, Empa, Eawag, states that the regulations with regard to secondary employment for the ETH Domain are sufficiently standardised. There is some potential for improvement in the implementation of the regulations.[5]

Audit and Executive Committees

The Audit Committee assists the ETH Board with financial supervision and the monitoring of risk management, of the ICS, and of financial auditing activities. As a rule, it is comprised of two to three "external" members of the ETH Board who are independent of the executive leadership, but may also involve additional people in a consultative capacity. The President of the ETH Board, the Head of the Internal Audit department and the Head of the Finance section of the ETH Board's staff attend the meetings in an advisory capacity.

The Executive Committee assists the ETH Board with preparing for and following up on meetings, filling management positions of institutions in the ETH Domain and fulfilling its duties as an employer. It also liaises with the social partners. It is comprised of the President of the ETH Board (chair), the Presidents of both Federal Institutes of Technology, the representative of the research institutes and the delegates of the University Assemblies. The Executive Director and, if necessary, other members of the ETH Board's staff attend the meetings.

1 The key legal bases can be found on the website of the ETH Board: www.ethboard.ch/legalbasis
2 www.efv.admin.ch/efv/en/home/themen/finanzpolitik_grundlagen/cgov/grundlagen.html
3 www.admin.ch/ch/d/cf/ko/interessenbindung_79.html
4 www.ethbaord.ch/vested-interests
5 SFAO-22472, publication of the report on the SFAO website on 31 January 2024: www.efk.admin.ch/en/publications/training-and-social-affairs/education-and-research/secondary-occupations-with-a-focus-on-conflicts-of-interest-eth-board-eth-zurich-epfl-psi-wsl-empa-eawag

Remuneration of the ETH Board

In 2023, the President of the ETH Board received for 0.8 FTE a gross salary of CHF 301,922 (with an annual salary of CHF 377,403 for 1.0 FTE). In addition, the employer paid social security contributions of CHF 95,715. The President is insured by the Swiss Federal Pension Fund, the rules of which determine the employer contributions.

Based on the decision of the Federal Council of 24 June 2020 regarding the fees of external members of the ETH Board who do not have an employment contract with an institution of the ETH Domain, the Vice President of the ETH Board and the President of the Audit Committee received in 2023 a lump-sum payment of CHF 32,000 each. In 2023, the other four external members of the ETH Board each received a lump sum of CHF 20,000. In addition, external members of the ETH Board were paid a total of CHF 79,500 for dialogue meetings, the Election Preparation Committees, etc. In addition, their expenses were refunded on the basis of the ETH Board Ordinance of 11 April 2002 concerning the reimbursement of expenses in the ETH Domain. "Institutional" members of the ETH Board who are employees of one of the institutions of the ETH Domain do not receive additional fees for their activities on the ETH Board. For the 0.7 FTE position, the ETH Board covered 40% of the wage and social security costs (including compensation for expenses) incurred by EPFL for the delegates of the University Assemblies of both Federal Institutes of Technology, in order to guarantee the delegates' independence.

Executive bodies of the ETH Domain

Presidency and members of the ETH Board
- Prof. Dr Michael O. Hengartner[1], President
- Prof. Dr Dr h.c. Barbara Haering[2], Vice President (until December 2023)
- Cornelia Ritz Bossicard[2], President of the Audit Committee
- Prof. Dr Joël Mesot[1]
- Prof. Dr Martin Vetterli[1]
- Prof. Dr Christian Rüegg[1]
- Dr Kristin Becker van Slooten[1]
- Marc Bürki[2]
- Beatrice Fasana[3]
- Prof. Dr sc. nat., Dr h.c. mult. Susan Gasser
- Christiane Leister

New member of the ETH Board
- Pascale Bruderer, Vice President (since January 2024)

Executive Board of ETH Zurich
- Prof. Dr Joël Mesot, President
- Prof. Dr Günther Dissertori, Rector
- Dr Julia Dannath-Schuh, Vice President for Personnel Development and Leadership
- Dr Robert Perich, Vice President for Finance and Controlling (until March 2023)
- Stefan Spiegel, Vice President for Finance and Controlling (since April 2023)
- Prof. Dr Ulrich Weidmann, Vice President for Infrastructure
- Prof. Dr Christian Wolfrum, Vice President for Research (since January 2023)
- Prof. Dr Vanessa Wood, Vice President for Knowledge Transfer and Corporate Relations

Executive Board of EPFL
- Prof. Dr Martin Vetterli, President
- Prof. Dr Jan Hesthaven, Vice President for Academic Matters
- Françoise Bommensatt, Vice President for Finance
- Dr Matthias Gäumann, Vice President for Operations
- Prof. Dr Gisou van der Goot, Vice President for Responsible Transformation
- Dr Ursula Oesterle, Vice President for Innovation

Directorate of PSI
- Prof. Dr Christian Rüegg, Director
- Prof. Dr Gabriel Aeppli, Deputy Director
- Dr Thierry Strässle, Deputy Director
- Dr Peter Allenspach, Member
- Prof. Dr Andreas Pautz, Member
- Prof. Dr Gebhard F. X. Schertler, Member
- Prof. Dr Thomas J. Schmidt, Member
- Prof. Dr Mike Seidel, Member

Directorate of WSL
- Prof. Dr Beate Jessel, Director (until July 2023)
- Dr Christoph Hegg, Acting Director (since August 2023)
- Prof Dr Jürg Schweizer, Member, Acting Deputy Director (since August 2023)
- Prof. Dr h.c. Anna Hersperger, Member
- Birgit Ottmer, Member
- PD Dr Anita Risch, Member (since October 2023)
- Dr Thomas Wohlgemuth, Member

Directorate of Empa
- Prof. Dr Tanja Zimmermann, Director
- Dr Peter Richner, Deputy Director
- Dr Brigitte Buchmann, Member (until July 2023)
- Dr Pierangelo Gröning, Member (until August 2023)
- Dr Lorenz Herrmann, Member (since January 2023)
- Dr Urs Leemann, Member

Directorate of Eawag
- Prof. Dr Martin Ackermann, Director (since January 2023)
- Prof. Dr Rik Eggen, Deputy Director (until April 2023, Member until December 2023)
- Dr Christian Stamm, Deputy Director (since April 2023)
- Prof. Dr Florian Altermatt, Member (since April 2023)
- Prof. Dr Jukka Jokela, Member (until February 2023)
- Prof. Dr Tove Larsen, Member (until October 2023)
- Dr Sara Marks, Member (since November 2023)
- Gabriele Mayer, Member
- Prof. Dr Carsten Schubert, Member
- Prof. Dr Lenny Winkel, Member (since April 2023)
- Prof. Dr Christian Zurbrügg, Member (until February 2023)

Appeal body

ETH Appeals Commission
The Internal Appeals Commission of the Federal Institutes of Technology decides on appeals against rulings made by bodies of the institutions of the ETH Domain (Art. 37 para. 3 ETH Act). It is an independent internal appeals body with its registered office in Bern and is administratively assigned to the ETH Board, to which it reports (Art. 37*a* ETH Act). Since 2022, the Federal Council elects the members of the ETH Appeals Commission. Appeals mainly relate to matters arising from legislation on higher education and human resources. The Commission is assisted by a secretariat (Article 11 et seq. of the Ordinance on the ETH Appeals Commission). Appeals against the rulings of the ETH Appeals Commission can be made to the Federal Administrative Court.

- Lawyer Barbara Gmür Wenger, President
- Dr iur. Beatrix Schibli, Vice President
- Prof. Dr Simone Deparis, Member
- Lawyer Anne Dorthe, Member
- Jonas Philippe, Member
- Dr Dieter Ramseier, Member
- Prof. Thomas Vogel, Member

ETH Board staff

Staff of the ETH Board
The ETH Board's staff help the ETH Board to fulfil its legal mandate, particularly regarding strategic leadership, supervision, promotion of cooperation in the ETH Domain and liaising with the Federal authorities (Art. 26*b* ETH Act).

Executive Team
- Dr Michael Käppeli, Executive Director
- Dr Monique Weber-Mandrin, Deputy Executive Director and Head of Legal Services
- Dr Kurt Baltensperger, Head of Science
- Gian-Andri Casutt, Head of Communications
- Dr Dieter Künzli, Head of Finance and Personnel
- Michael Quetting, Head of Real Estate

Internal Audit
The ETH Board employs Internal Audit staff, as per Art. 35*a*[ter] ETH Act.
The department conducts internal audits for the institutions of the ETH Domain.
- Patrick Graber, Chief Audit Executive

[1] Member of the Executive Committee
[2] Member of the Audit Committee
[3] Member of the Audit Committee since January 2024

Status as of 31 December 2023
(reference is also made to changes agreed upon in 2023 which will become effective in 2024)

Ombuds Office

Ombuds Office
The Ombuds Office of the ETH Board is an independent body responsible in a subsidiary capacity for dealing with reports of illegal and unethical conduct observed by members of the ETH Domain in the course of ETH Domain-related activity. Subsidiary capacity means that, whenever possible, reports must initially be made inside the two Federal Institutes of Technology or the four research institutes, first to senior bodies or, if this is deemed unreasonable, to the bodies responsible for dealing with such reports in the institutions concerned.

This applies without prejudice to Art. 22*a* of the Federal Personnel Act (FPA): employees are obliged to report all officially prosecutable crimes or offences that they have discovered during their official work or that have been reported to them, to the criminal prosecution authorities, their line managers or the SFAO.

The Ombuds Office consists of:
- Dr Res Nyffenegger, external lawyer in Bern (until December 2023)
- Dr Michael Daphinoff, LL.M., external lawyer in Bern (since January 2024), and
- Cendrine Rouvinez, MLaw, external lawyer in Lausanne and Sion (since January 2024)

Conciliation Commission

Conciliation Commission under the Gender Equality Act for the ETH Domain
The Conciliation Commission under the Gender Equality Act for the ETH Domain provides information and advice in the event of disputes that fall under the Gender Equality Act and involve employment relationships in the ETH Domain. The aim of the conciliation process is to achieve a mutually acceptable solution to the dispute in verbal negotiations, with the assistance of the parties (employer and employee), in order to avoid court proceedings. The Conciliation Commission does not issue any judgements. It handles cases confidentially, but not anonymously.

President's Office:
- Dr Anne-Catherine Hahn, President

Employer representatives:
- Hélène Fueger, EPFL (Member)
- Andreas Kirstein, ETH Zurich (Member)
- David Heusser, Empa/WSL (substitute Member)
- Beatrice Lamprecht PSI/Eawag (substitute Member)

Employee representatives:
- Gregor Spuhler, ETH Zurich (Member)
- Prof. Dr Sabine Süsstrunk, EPFL (Member)
- Dr Rowena Crockett, Empa/WSL (substitute Member)
- Dario Marty, PSI/Eawag (substitute Member)

Monitoring and auditing

Internal control system
The institutions of the ETH Domain each have an ICS (Art. 35*a*[bis] ETH Act) introduced in accordance with the Federal Government's specifications. Its objectives are to protect the assets of the ETH Domain, to prevent errors and irregularities in accounting, and to ensure proper accounting and reliable reporting. It is an integral part of the audit by the Swiss Federal Audit Office (SFAO) or the auditors appointed by it. The focus is on financially relevant business processes.

Internal Audit
The Internal Audit department conducts internal revision for the institutions of the ETH Domain (Art. 35*a*[ter] para. 1 ETH Act). This department reports directly to the President of the ETH Board and its activities are supervised by the Audit Committee. The Internal Audit department provides independent and objective auditing services. It is also responsible for coordinating and supporting the external audits of the ETH Domain.

Auditors
The SFAO performs external auditing duties for the ETH Domain (Art. 35*a*[ter] para. 3 ETH Act). In 2023, it audited the consolidated financial statements of both Federal Institutes of Technology and the consolidated financial statements of the ETH Domain, and it conducted interim audits. The audits of the research institutes are performed by the SFAO jointly with PricewaterhouseCoopers (PwC). The SFAO's audit report on the consolidated financial statements of the ETH Domain comprises an audit report and a so-called "comprehensive report". These reports are discussed with representatives of the SFAO in the Audit Committee every year. In 2023, the SFAO invoiced the ETH Board for the total amount of CHF 553,798 (CHF 330,215 for the 2023 annual audit and CHF 223,583 for the 2023 interim audit).

Information policy
Its legal mandate makes the ETH Board an interface between academia, policymakers and society. Within its rules of procedure, the ETH Board undertakes to ensure honest, appropriate and transparent communication for the benefit of society with the aim of explaining its decisions and reinforcing the role and reputation of the ETH Domain. Responsibility for this rests with the President. The key communication tools are the ETH Board's Annual Report to the Federal Government, the website www.ethboard.ch, targeted media relations work, and the case-by-case illumination of relevant facts and positions, particularly regarding policies on education, research, and innovation.

Participations and cooperations

In accordance with Art. 3*a* ETH Act, the two Federal Institutes of Technology and the four research institutes may found or invest in companies, or cooperate with third parties in any other way within the framework of the Federal Council's strategic objectives and the ETH Board's directives, for the purpose of fulfilling their duties. The investments and relationships with controlled and associated entities are listed in sections 20 and 35 of the annual financial statements in the ETH Board's Annual Report and Financial Report, respectively. These mainly involve investments in foundations and simple partnerships that meet accounting standards. The controlled entities Société du Quartier de l'Innovation (SQIE) and Société du Quartier Nord de l'EPFL (SQNE), which maintain buildings on a finance lease basis with contracts over a lease term of up to 40 years, generate cash outflows therefrom of about CHF 10 million per year. The associated entities have significant investments in the ETH Zurich Foundation. The contribution to the annual result of the ETH Domain amounted to CHF 8 million.

Michael O. Hengartner
* 1966, Swiss/Canadian
Prof. Dr

President of the ETH Board since February 2020.

Michael O. Hengartner served as President of the University of Zurich (UZH) from 2014 to 2020, and President of swissuniversities from 2016 to 2020. He has dual Swiss and Canadian citizenship and grew up in Quebec City, where he studied biochemistry at the Université Laval. In 1994, he was awarded his doctorate at the Massachusetts Institute of Technology in the laboratory of Nobel Laureate H. Robert Horvitz. He then headed a research group at the Cold Spring Harbor Laboratory, (New York, USA). After that, Hengartner was appointed Professor at the Institute of Molecular Biology in 2001, and Dean of the Faculty of Science at UZH from 2009 to 2014. He has an Executive MBA from IMD Lausanne and a number of awards for his research and teaching skills.

Barbara Haering
* 1953, Swiss/Canadian
Prof. Dr sc. nat., Dr h. c. sc. pol.

Vice President of the ETH Board since 2021.
Member of the ETH Board and of the Audit Committee since 2008.

Barbara Haering studied Natural Sciences and obtained a doctorate in Spatial Planning at ETH Zurich in 1996. She runs Barbara Haering GmbH for strategic consulting of public and private institutions. In addition, she chairs the Conseil d'orientation stratégique at the University of Geneva and the Council of Foundation of the Geneva International Centre for Humanitarian Demining. Moreover, Haering is a member of the University Council of Dresden University of Technology and a member of the Research and Technology Advisory Committee at Graz University of Technology. She is also a lecturer at the University of Lausanne.

Joël Mesot
* 1964, Swiss
Prof. Dr. sc. nat.

Member of the ETH Board and of the Executive Committee since 2010. President of ETH Zurich since 2019.

Joël Mesot studied Physics at ETH Zurich, obtaining a doctorate in Solid State Physics in 1992. He was awarded the Swiss Physical Society (SPG) IBM Prize in 1995 and the ETH Zurich Latsis Prize in 2002. After research residencies in France and the US, he came to ETH Zurich and joined PSI, where he became Head of the Laboratory for Neutron Scattering in 2004. He was director of PSI from 2008 to 2018, and he has been a full professor of physics at ETH Zurich since 2008. Mesot is part of various national and international advisory bodies, including the Foundation Board of the "Switzerland Innovation" Park, the Marcel Benoist Foundation and the Governing Board CREATE (Singapore).

› Markus Bertschi/ETH Zurich

Marc Bürki
* 1961, Swiss
Dipl. El.-Ing.

Member of the ETH Board since 2017 and of the Audit Committee since 2018. CEO of Swissquote Group Holding Ltd since 1999 and of Swissquote Bank Ltd since 2002.

Marc Bürki has a degree in Electrical Engineering from EPFL. After gaining his initial professional experience with the European Space Agency in the Netherlands, he formed Marvel Communications S.A., a company that specialised in the development of financial information software, in Gland in 1990. Swissquote Group Holding Ltd, which specialises in online trading, was formed in 1999 and was floated on the stock market in 2000. In 2001, Swissquote Bank Ltd received a banking licence. Bürki is the CEO of both companies. Furthermore, he is President of the Board of Directors of Swissquote MEA Ltd, Dubai, UAE (since 2012), of Swissquote Ltd, London, UK, of Swissquote Asia Ltd, Hong Kong (both since 2014), of Swissquote Pte. Ltd, Singapore, and of Swissquote Bank Europe SA, Luxembourg (both since 2019). Since 2021, he has been President of the Board of Directors of YUH Ltd, a joint venture between Swissquote and PostFinance.

› Swissquote

Beatrice Fasana
* 1969, Swiss
Dipl. Ing. Lm

Member of the ETH Board since 2012.
Managing Director at Sandro Vanini SA since 2013.

Beatrice Fasana studied Food Science at ETH Zurich. After a traineeship at the "Nestlé Research and Development Center" in New Milford (Connecticut, USA), she worked in various leadership roles for several large food and beverage production companies in Switzerland, including manager of Chocolat Frey's "Chewing Gum" Profit Center and as a marketing manager for Coca-Cola. Until the end of 2012, she ran her own company, BeFood Consulting SA. Since 2013, she has held the position of Managing Director at Sandro Vanini SA, a company of the Haecky Group. Fasana is also a member of the Board and Chair of the Management Committee of the University of Applied Sciences and Arts of Southern Switzerland (SUPSI, Scuola universitaria professionale della Svizzera italiana), and has been a member of the Board of Directors of Raiffeisen Bank del Basso Mendrisiotto since 2018.

Susan Gasser
* 1955, Swiss
Prof. Dr sc. nat., Dr h. c. mult.

Member of the ETH Board since 2018. Director of the ISREC Foundation at the AGORA Research Centre since February 2021. Visiting professor at the University of Lausanne since 2021.

Susan Gasser studied Biology and Biophysics at the University of Chicago and obtained a doctorate at the University of Basel. She was group leader at the Swiss Institute for Experimental Cancer Research (ISREC) from 1986 until she was appointed full professor at the University of Geneva in 2001. From 2004 to 2019, she was Director of the Friedrich Miescher Institute for Biomedical Research (FMI) in Basel. She was also a full professor of Molecular Biology at the University of Basel from 2005 to 2021. Since 2021, she has been a visiting professor at the University of Lausanne and the ISREC Foundation Director at the AGORA Research Centre. Gasser chairs the scientific advisory board of the Helmholtz Association health centres (research area health), is a member of the scientific advisory board of the Francis Crick Institute in London and a member of the European Molecular Biology Laboratory (EMBL Council) in Heidelberg. From 2014 to 2019, she chaired the Gender Equality Commission of the SNSF.

› Nestlé Nutrition Council

Martin Vetterli
* 1957, Swiss
Prof. Dr sc.

Member of the ETH Board and of the Executive Committee since 2017. President of EPFL since 2017.

Martin Vetterli received his degree in Electrical Engineering from ETH Zurich in 1981, his Master of Science at Stanford University in 1982, and obtained his doctorate at EPFL in 1986. Following professorships at Columbia University and at the University of California, Berkeley, he returned to EPFL as full professor of Communication Systems in 1995. From 2000 to 2003, Vetterli was a member of the Swiss Science Council (SSC). From 2004 to 2011, Vetterli was Vice President of EPFL, and Dean of the School of Computer and Communication Sciences at EPFL from 2011 to 2012. From 2013 to the end of 2016, he was President of the National Research Council of the Swiss National Science Foundation (SNSF).
› Nik Hunger / EPFL

Christian Rüegg
* 1976, Swiss
Prof. Dr sc. nat.

Member of the ETH Board since June 2022 and representative of the research institutes. Director of PSI since 2020. Dual professorship at ETH Zurich/EPFL and professor at the University of Geneva.

Christian Rüegg studied Physics at ETH Zurich, obtaining his doctorate in 2005 at the Laboratory for Neutron Scattering at ETH Zurich and PSI. From 2005 to 2011, he worked at the London Centre for Nanotechnology of University College London (UCL) and Imperial College London. He was a Royal Society University Research Fellow and Assistant and Associate Professor at UCL. From 2011 to 2016, he headed the PSI Laboratory for Neutron Scattering and Imaging in the Research Division Neutrons and Muons, and from 2017 to 2020, he was the head of this Research Division. Rüegg represents PSI on numerous international committees for large-scale research facilities and as part of important cantonal/national initiatives for the promotion of innovation, such as Switzerland Innovation. › PSI

Kristin Becker van Slooten
* 1962, Swiss/German
Dr

Member of the ETH Board and of the Executive Committee since 2017. Representative of the university assemblies of ETH Zurich/EPFL on the ETH Board. Project head of equal opportunities at EPFL since 2017. Maître d'enseignement et de recherche (MER).

Environmental scientist Kristin Becker van Slooten studied Biology at the University of Geneva and obtained her doctorate in Environmental Chemistry and Ecotoxicology at EPFL. From 1995 to 2002, she was employed as a scientist at the Laboratory for Environmental Chemistry and Ecotoxicology, where she headed up the Experimental Ecotoxicology research group from 2002, obtaining the title of MER in 2005. From 2006 to 2016, she was an advisor to the President and General Secretary of EPFL. Becker van Slooten has been the project manager for equal opportunities at EPFL since 2017 and has reprised her role as a delegate on the ETH Board, representing the university assemblies of ETH Zurich and of EPFL as she did from 2004 to 2006.

Christiane Leister
* 1955, Swiss/German
Graduate economist (Dipl.-Vw.)

Member of the ETH Board since 2017. Owner and President of the Board of Directors of the Leister Group since 1993.

After graduating from Christian Albrecht University of Kiel with a degree in Economics, Christiane Leister started her career at Jungheinrich (floor-level conveyors and warehousing systems). She then headed the Controlling and Finance departments of Vereinigte Papierwerke AG and Milupa AG. She took over strategic and operational duties within the Leister family business in 1989. She has been the owner of the Leister companies since 1993, where she also acted as operations manager until 2014. During that time, Leister diversified the companies with new technologies and expanded them internationally to create the Leister Group.
› Leister Ltd

Cornelia Ritz Bossicard
* 1972, Swiss
Business economist, CPA

Member of the ETH Board and President of the Audit Committee since May 2021. Independent board member.

Cornelia Ritz Bossicard studied Business Administration at HEC Lausanne and Freie Universität Berlin, and obtained a Master of Science in Business Administration. In addition, she is qualified as both a Swiss Certified Accountant and a US Certified Public Accountant (CPA). From 1995 to 2014, she worked as an auditor with PwC, both in Switzerland and Silicon Valley (USA). Since 2014, she has been a sparring partner for strategy, corporate governance and finance and served on a variety of boards of multinational companies as an independent board member. She is the founder of 2bridge Ltd and, among other things, President of IVF HARTMANN, swissVR, and the César Ritz Foundation Niederwald, and a member of the administration of the Federation of Migros Cooperatives and of the Board of Directors of Läderach. Having chaired various audit committees for many years, Ritz Bossicard is a recognised expert in financial supervision.
› Cornelia Ritz Bossicard

New Vice President of the ETH Board from 2024: Pascale Bruderer

Pascale Bruderer (* 1977, Swiss) is an entrepreneur and independent board member. She has a great deal of experience with regulation, communication and the digital transformation, and also has a vast network in the fields of science and politics. She was a member of the National Council and a member of the Science, Education and Culture Committee (from 2002 to 2011). In 2009/2010, she was the President of the National Council, and, from 2011 to 2019, a member of the Council of States. Today she is an independent entrepreneur and a member of several boards of directors. She is the Founder and President of the Board of Directors of Swiss Stablecoin AG and, among other things, a member of the Board of Directors of the Galenica Group and the TX Group/Tamedia. Having Bruderer as a new member will continue to ensure the close connection between science, economy and politics on the ETH Board.

A complete overview of the vested interests of the members of the ETH Board can be found at www.ethboard.ch/vestedinterests.

Personnel matters

Personnel matters of the Federal Council

Election of the new ETH Board Vice President
The Federal Council elected Pascale Bruderer as the new Vice President of the ETH Board on 24 May 2023. She took up the position on 1 January 2024, replacing the former Vice President Barbara Haering, who stepped down at the end of 2023. Bruderer brings great experience and a broad network in the fields of business and politics. She is a former member of the Council of States and the National Council, and a former National Council President. Today she is an independent entrepreneur and a member of several boards of directors. Her expertise makes her the perfect addition to the ETH Board. Having Pascale Bruderer as a new member will continue to ensure the close connection between science, economy and politics on the ETH Board.

Re-election of the PSI Director
At the request of the ETH Board, the Federal Council confirmed Professor Christian Rüegg in his position as Director of the PSI on 8 December 2023. His mandate will extend for another four years from 1 April 2024. Under Professor Rüegg's leadership, the PSI has strengthened its position in Switzerland as an excellent research institute for natural and engineering sciences. He is a member of the ETH Board, where he represents the PSI, WSL, Empa and Eawag research institutes.

Resignation of the WSL Director
On 28 June, the Federal Council approved the resignation of Professor Beate Jessel as Director of WSL at the end of July 2023. Professor Jessel is once again devoting more time to teaching and research in landscape conservation and has been a Professor of Landscape Development at the EPFL in Lausanne since August 2023. The vacant position for a new Director of WSL was posted at the end of 2023; the election preparation procedure is ongoing.

Personnel matters of the ETH Board

Appointment to the Executive Board of ETH Zurich
The ETH Board appointed Stefan Spiegel as a new member of the Executive Board of ETH Zurich. He took over the Vice-Presidency of Finance and Controlling on 1 April 2023, succeeding Robert Perich. Spiegel studied theoretical physics at the University of Zurich and earned an Executive MBA in the dual degree programme of the Vienna University of Economics and Business and the Carlson School of Management at the University of Minnesota. He has many years of management experience as Head of Finance, Head of Controlling, and as a project managerfor organisational development in the financial sector of national and international companies. Spiegel was most recently CFO and member of the Executive Board of SBB Cargo AG.

Appointment of a new member to the WSL Directorate
The ETH Board appointed Anita Risch as a new member of the WSL Directorate. Risch is an outstanding biodiversity researcher with a broad national and international network. As an ecologist and privatdozent at ETH Zurich and at WSL, she researches the functions and interdependencies of plants, animals and soil life in ecosystems. With the appointment of Risch as of 1 October, the WSL Directorate now consists of three women and three men.

Appointment of a new member to the Eawag Directorate
The ETH Board appointed Dr Sara Marks as a new member of the Directorate at Eawag. Marks brings great experience in implementing research in practical applications. With her education at Stanford University, research work at Johns Hopkins University and project management experience in 11 different countries, she will further strengthen the Eawag Directorate's global perspective. Following Marks' appointment on 1 November 2023, the Directorate now consists of three women and four men.

Professorial matters
Refer to the right-hand side of page 47 for information about the appointment of professors.

Professorial matters

Appointment of professors
In 2023, the ETH Board dealt with 185 professorial matters at its meetings. It appointed a total of 82 professors, 45 of whom were newly appointed persons and 37 of whom were internal promotions. At ETH Zurich, 21 women and 29 men were appointed, and 9 women and 23 men were appointed at EPFL.

Out of the 27 full professor appointments, 15 involved promotions of associate professors, and one was a promotion of an associate professor with tenure track. Of the 25 associate professor appointments, 21 were promotions of associate professors with tenure track.

Women accounted for 22 (48.9 %) of the 45 newly appointed professors in 2023. Over the past four years, the average proportion of women among newly appointed professors has been 43.9 %.

The ETH Board awarded the title of professor (adjunct professor) to 18 researchers, including three women. In addition, it awarded the title of "Professor of Practice" to one woman and one man.

Retirements and resignations
In 2023, the ETH Board was informed of 28 retirements for reasons of age: 18 from ETH Zurich and 10 from EPFL. In addition, ETH Zurich and EPFL advised the ETH Board of a total of five resignations for other reasons.

Appointments

82

professors,
21 of whom were women and 29 men at ETH Zurich, as well as 9 women and 23 men at EPFL

Proportion of women

48.9 %

of newly appointed persons

The total of 82 appointments comprised:

Full professors

27

11 of whom were women

Associate professors

25

6 of whom were women

Associate professors with tenure track

16

8 of whom were women

Associate professors without tenure track

14

5 of whom were women

Risk situation and risk management

As the managing and supervisory body, the ETH Board sets out the risk policy for the ETH Domain. In this capacity, it has set targets for the two Federal Institutes of Technology and the research institutes. On the one hand, this serves to ensure that the tasks are performed effectively, cost-efficiently and with foresight, and that functional and innovative capabilities are maintained. On the other hand, it must also guarantee personal safety and the security of property and other assets to the greatest possible extent. The leadership of the institutions of the ETH Domain is intended to be supported by comprehensive, transparent and up-to-date risk information and risk awareness among students and employees, and the good reputation of the ETH Domain is to be safeguarded.

The presidents of ETH Zurich and the directors of the research institutes are responsible for risk management. All the institutions of the ETH Domain have their own procedures for risk management that serve to identify and evaluate the individual risks, as well as strategies for coping with them and for monitoring them appropriately. The risk management activities and supervision of risk management procedures are coordinated in each institution by a risk manager and / or a risk committee. Each institution keeps its own risk catalogue in which the identified risks are described in detail with an assessment on the basis of probability of occurrence and extent of the potential damage. Here, consideration is given to the possible effect a risk could have on reputation. The individual profile, specific focus and size of each institution are reflected in its risk catalogue. Thus, the two Federal Institutes of Technology have different core risks to the four research institutes, and the assessment of the same risks can vary.

As part of their annual reporting to the ETH Board, the institutions provide information about their core risks, in particular their current status, extent and possible consequences. Core risks are those with potentially significant financial consequences and/or that have an above-average probability of occurring. They directly endanger the fulfilment of the institutions' legal duties. The reports on the core risks are then submitted to the department responsible for the ETH Domain (EAER). Moreover, the institutions are obliged to inform the ETH Board directly about any extraordinary changes in risk or damaging events.

The effects of an inhibiting political and legal environment (especially the relationship between Switzerland and the EU and the resulting non-association of Switzerland in Horizon Europe), the sharp increase in energy prices and the threat of power shortages, and the uncertainty in terms of funding developments are three of the greatest risks faced by the ETH Domain. Non-association also carries the risk of losing competitiveness as well as difficulties in recruiting and retaining leading researchers. Other core risks of the ETH Domain are associated with the significant impairment of an institution's operations due to major events (e.g. pandemics or geopolitical conflicts), cyberattacks, possible infringements of scientific integrity and good academic practice, violence/threats against people and the loss of key personnel, taking on excessive financial obligations and the risk of a lack of oversight of such financial obligations and the consequences of such, and the loss of management/control due to the creation of external structures.

Despite careful risk management, it cannot be ruled out that an institution may be affected by a damaging event that jeopardises the fulfilment of its duties enshrined in law. In this case, the ETH Board will submit a request to the Federal Department of Economic Affairs, Education and Research (EAER), for the attention of the Federal Council, to adapt the strategic goals or increase the federal financial contribution in accordance with Art. 30(2) of the Ordinance on Finance and Accounting of the ETH Domain following consultation with the Federal Finance Administration (FFA).

Insurance

The institutions must take out insurance against possible losses, subsidiary to other measures, where such insurance is feasible and the funding is sufficient for it. Each institution is responsible for taking out insurance cover and administering its own insurance portfolio. When doing this, they must take into account their specific risk situation, strive for an appropriate cost/benefit ratio and ensure compliance with the federal regulations governing public sector procurement. The insurance cover must meet the standards that are customary in the Swiss insurance market and be concluded with an insurance institution that is licensed in Switzerland. The institutions have taken out property and employers' liability insurance policies, as well as smaller insurance policies for specific risks. The real estate owned by the Federal Government but used by the ETH Domain is not insured, because the Confederation follows a strategy of self-insurance. This category includes the damage caused to the cooling water pipes on the EPFL campus in Ecublens due to the very rapid spread of quagga mussels in Lake Geneva.

STRATEGIC OBJECTIVES

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Details of the Federal Council's stratetic objectives on the ETH Domain can be found on the SERI website www.sbfi.admin.ch under Higher Education/ETH Domain.

Strategic objective

TEACHING

1

The student and doctoral student population of ETH Zurich and EPFL has continued to grow, numbering 38,437 people in 2023. This increase poses a risk to the quality of teaching in the long term. This is what prompted the publication of a strategy for the development of student enrolment in the ETH Domain during the year under review.

Excellence in research-based and competency-based education

In 2023, the student and doctoral student population at ETH Zurich and EPFL numbered 38,437, representing a year-on-year increase of 1.8% for ETH Zurich and 6.9% for EPFL. The proportion of women in the student and doctoral community continued to increase slightly (2023: 32.7%, 2022: 32.4%). This percentage increased from 31.8% in 2022 to 32.1% in 2023 at the Bachelor's and Master's levels. The proportion of foreign nationals increased from 49.5% to 50.5% (38.3% at the Bachelor's level, 52.4% at the Master's level and 79.1% at the PhD level). (For detailed figures on education, see p. 92 et seqq.)

The institutions of the ETH Domain are continuously expanding their educational offerings so as to best meet society's expectations, among other things. Thus, in 2023, ETH Zurich introduced a new interdisciplinary Master's programme jointly organised with the University of Zurich entitled Brain Sciences, which focuses on brain biology, the neural system and neuroscience. ETH Zurich has also expanded its range of programmes by introducing a new Master's degree in Biochemistry – Chemical Biology, as well as Switzerland's first-ever Master's degree in Space Science and Technology (see also Report, p. 16). At EPFL, a new interdisciplinary minor in Imaging was launched in 2023, covering a wide range of imaging concepts and skills ranging from instrumentation techniques to image processing analysis. The three Master's programmes NeuroX, Quantum Science and Engineering, and Statistics launched by EPFL in 2022 were very successful in 2023 as well. In addition to the new programmes launched in 2023, ETH Zurich has undertaken several major reforms of existing Bachelor's and Master's degree courses. At the doctoral level, ETH Zurich launched a new PhD programme in Translational Engineering of Biological Systems in collaboration with the Institute of Human Biology of the Roche Innovation Centre in Basel during the reporting period (see also Objective 5, p. 71). The PhD programme in Learning Science, a joint programme run by ETH Zurich and EPFL, remains attractive, with the second cohort of PhD students joining the programme in 2023.

The research institutes are also involved in the creation and development of new courses both within the ETH Domain and at other universities in Switzerland. For example, Empa supported the creation of a new Engineering degree course at the University of Bern, and Eawag contributed to the creation of a new Biodiversity course of study at the University of Zurich. With a total of 25,617 hours of tuition at universities, the amount of teaching provided by PSI, WSL, Empa and Eawag has further increased (in 2022 it was 21,348 hours). The number of Bachelor's and Master's theses as well as doctoral theses supervised by the institutions amounted to 716 and 950, respectively, over the reporting period. Moreover, during the same

An inspiring workplace for students under the dome of ETH Zurich.
› Alessandro Della Bella/ ETH Zurich

period, several scientists from research institutes were appointed to the pool of professors at universities in Switzerland.

Promotion of transversal skills

The acquisition of transversal skills is an essential part of high-quality education and is also key to strengthening career prospects and enabling graduates to make a positive contribution to society. In order to offer students better guidance in relation to the opportunities available, ETH Zurich encourages those exercising a teaching role to specify in their course descriptions which methodological, personal and social skills students can expect to develop. At EPFL, the focus on the development of transversal skills was reinforced in 2023 with the transformation of the Career Centre into the Transversal and Career Competence Centre. Alongside the change in name, this development extends the Centre's mission to promote teaching and acquisition of relevant skills in areas such as project management, entrepreneurship, ethics and sustainability. Since September 2023, EPFL students have been able to get an overview of the transversal skills courses offered through the dedicated platform (EPFLcareer.ch).

The Swiss Federal Institutes of Technology continue to implement their respective programmes with a view to promoting interdisciplinary approaches and project-based teaching (such as ETH Talent at ETH Zurich and the MAKE programme at EPFL) – whilst also working on new initiatives and proposing new projects to help support this. For example, ETH Zurich has launched the strategic initiative PBLabs (Project-Based Labs) to develop and improve project-based teaching. PBLabs offers various interdisciplinary programmes through which students can broaden their transversal skills under the guidance of coaches. The aim is to contribute to innovative teaching by means of an additional offering that lies somewhere between traditional courses and the completely autonomous environment of the Student Project House. As for EPFL, 2023 saw its LEARN Centre launch the project 3T play in collaboration with the College of Management of Technology. Funded by the LEGO Foundation, this project aims to develop learning tools that use tangible methods and objects to teach transversal skills.

Computational skills are an integral part of the curricula developed by ETH Zurich and EPFL. The Swiss Federal Institutes of Technology play an active role in projects linked to contributions subsidised by the Federal Government by participating in the Strengthening Digital Skills in Education programme. Organised by EPFL for the first time in 2021, workshops for the use of programmable notebooks in teaching at EPFL, ETH Zurich and the University of Neuchâtel continue to be met with great success. A new area of activity has focussed on the ethical aspects related to the responsible use of information systems. Artificial intelligence (AI) in education is a very topical subject. In 2023, ETH Zurich's Division for Teaching Development and Technology put on several events for teachers on this topic that complemented the events on the use of AI organised by the ETH Zurich Library for students. Computational skills and artificial intelligence are also central to further education programmes.

The institutions are actively involved in training primary and secondary school teachers in computer science and computational thinking. Founded in 2009, the STEM Education Centre at ETH Zurich (the STEM Learning Centre) aims to improve education in STEM subjects. In addition to the usual activities in this

field, this reporting period saw EPFL's Education Promotion Service join forces with the Swiss Academy of Engineering Sciences (SATW) to organise the symposium "Education for the Future". The idea was to bring together stakeholders from the education sector to uncover innovative practices, share experiences in this field and reflect together on the challenges that await the schools of tomorrow. Since 2020, teachers from across Switzerland have been taking part in the GymInf further education programme, a nationally coordinated educational programme for teachers already working at Matura schools who would like to acquire the required qualification for teaching computer science. The EPFL-based Center for Digital Trust (C4DT) supports this effort by participating in cybersecurity courses.

Communication skills are also becoming increasingly important when it comes to educating scientists. From 2023, researchers from the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) will have access to the further education programme in scientific communication offered by the Communication Academy at ETH Zurich.

Innovation and quality assurance in teaching

Providing high-quality education is a priority for the ETH Domain. Its institutions take the necessary measures to ensure the excellence of their curricula at all times. This includes evaluating their programmes and student satisfaction. The evaluation of degree courses at ETH Zurich forms part of departmental evaluations. Teaching has recently become more relevant within these assessments, which are carried out for each department at least every eight years. All EPFL Bachelor's and Master's Engineering programmes currently undergo an evaluation process by the Swiss Agency of Accreditation and Quality Assurance (AAQ) and the French Engineering Degrees Conferment Commission (CTI). The contribution of the research institutes to teaching is also addressed during their regular institutional evaluations.

Student satisfaction is subject to regular evaluation as well. At ETH Zurich, students evaluate courses and exams on an alternating basis. What's more, they are given the opportunity to provide feedback on their courses each semester. ETH Zurich undertook a review of its student survey on the quality of courses and exams in order to identify opportunities for improvement in the survey and the resulting process. Peer Feedback on Teaching was launched at ETH Zurich in 2023 as a new tool aimed at improving teaching. The idea is to set up reciprocal lecture and class visits for teaching staff as an opportunity to exchange valuable suggestions and ideas for designing courses. At EPFL, an in-depth evaluation of teaching is carried out for all Bachelor's and Master's courses by the student cohorts at the end of each semester; this can also be customised at the request of the member of teaching staff.

In 2023, ETH Zurich launched the extensive PAKETH project (Examinations and Academic Calendar at ETH Zurich) with view to ensuring excellent and attractive education on a sustained basis. PAKETH aims to remove barriers to the development of teaching at ETH Zurich and to give students greater flexibility. The primary issues it aims to tackle are the complexity of exams and the academic calendar. The project guidelines have been set out in a preliminary draft, which is ongoing, and the implementation of the final project will begin in the summer of 2024. EPFL also wants to alleviate the pressure on students and has therefore extended the exams for the core first-year courses by 30 minutes without changing the level or the difficulty of the exam. This measure has been in place since the spring of 2022 and is currently undergoing evaluation to determine its impact, in particular on the success of studies in the years that follow.

The Swiss Federal Institutes of Technology are also implementing measures aimed at boosting students' success in their studies. 2023 saw additional first-year support set up at EPFL for those with little access to additional resources (help from family, private lessons, etc.). This means the entire first-year student community can call on a team of assistants, every night of the week, for help with core first-semester subjects.

Promotion of national and international mobility

The institutions of the ETH Domain encourage mobility during studies. In 2023, ETH Zurich had around 300 incoming mobility students per semester. For EPFL, there were 763 in the spring semester, and 575 in the autumn semester. On the other hand, around 250 of those enrolled in a Bachelor's or Master's degree at ETH Zurich and about 450 from EPFL spent time at another university in Switzerland or abroad (see key figures, p. 98).

Since 2022, ETH Zurich has been part of the ENHANCE alliance of European universities, which is pursuing the ambitious aim of setting up a "European campus". Among other things, the 10 partner universities are hoping to promote the mobility of their student population by developing courses open to all, or by looking into the development of joint courses, the credits of which will be recognised by all members of the alliance. Likewise, EPFL joined up to the EuroTeQ alliance of European universities, which also aims to promote student mobility, among other things. (See also Objective 6, pp. 73–74.)

Summer schools play an important role in promoting cross-institutional exchanges. During the reporting period, EPFL and ETH Zurich supported six doctoral summer schools as part of their joint programme, one of which was organised on the basis of a tripartite agreement with PSI. Eawag hosted the 14th edition of the Summer School on Environmental Systems Analysis and, for the fourth time running, PSI ran the "Condensed Matter Summer Camp", which was attended by more than 100 people in 2023, including many PhD students. WSL is also an active organiser of international summer schools (see Objective 6, p. 73).

Further education

All institutions of the ETH Domain offer a range of further education programmes tailored to the needs of society. ETH Zurich's extensive range of further education programmes is increasingly incorporating topics related to sustainability. For instance, a CAS in Climate Innovation and a CAS in Regenerative Systems were run for the first time in 2023. Similarly, EPFL has introduced an MAS in Sustainable Energy Systems Engineering and an MAS in Sustainable Resilient Value Chains, as well as other shorter courses in this field. EPFL also surveyed its community to find more ideas for new and relevant courses to complement its current offering.

In order to create added value, the research institutes have decided to join forces and collaborate more closely in the field of further education by creating the Lead Campus. Since January 2024, the Lead Campus has become the joint training centre for the four research institutes. It is also open to people external to the institutes. In addition, PSI has introduced a new internal system for managing training programmes with the aim of improving efficiency.

Strategy for the development of enrolment at the undergraduate, graduate and doctoral levels

The reporting period saw the ETH Board publish its strategy for the development of student enrolment. It was developed alongside the institutions and aims to put forward guidelines and measures to mitigate the risks that an increase in the number of students could pose to the quality of education. The approaches presented in the strategy are divided into three areas of action: "identifying and defining thresholds in terms of quality and capacity", "implementing measures to ensure quality and capacity in the long term" and "limiting access to education as a last resort". The institutions of the ETH Domain are responsible for the implementation of the relevant measures.

The growth of the student and doctoral student population is mainly due to the growth observed in Computer Science and Communication Technology (+120% of students and doctoral students between 2014 and 2023, with an average of +34.7% across all disciplines; see figures on p. 94). The growth of the student population is consistent with the demand for specialists in the labour market but also poses a great challenge. In order to respond to this, ETH Zurich has set up a task force to examine aspects related to the growth in the number of students. It's with this in mind that ETH Zurich's management has decided on an admissions strategy that is in line with the ETH Board's overall strategy. The research institutes support the ETH in its attempt to overcome these challenges by actively participating in the teaching and supervision of students (see also pp. 50–51).

Strategic objective

RESEARCH

2

Research within the ETH Domain is in full swing with significant developments on several key topics such as quantum science, artificial intelligence (AI), space research, and energy and climate. The Swiss Federal Institutes of Technology continue to maintain their presence at the top of international rankings and have received numerous research prizes and support grants in during the reporting period.

A leader in international research

The institutions of the ETH Domain are involved in leading research, covering a vast range of activities from pure research to more practice-oriented projects. AI is an important area of research within the ETH Domain. In 2023, EPFL launched a centre dedicated to AI with a similar focus to the ETH AI Center. At the end of the reporting period, ETH Zurich and EPFl launched their joint "Swiss AI" initiative. The aim of the initiative is to offer Swiss research an open platform for large language models and to position Switzerland as a leading global centre for the development and use of transparent and reliable artificial intelligence. Another highlight was the signing of the partnership between ETH Zurich and the Dieter Schwarz Foundation at the end of 2023 to create a new teaching and research centre for a responsible digital transformation. This partnership should enable ETH Zurich to expand its research and teaching, particularly in the area of AI.

AI is also being implemented in many projects and technologies that are being developed within the ETH Domain (see Report, p. 12 et seqq.). As part of the Engineering Humanitarian Action initiative (see Objective 6, p. 74), led in conjunction with ETH Zurich, EPFL and the ICRC, a machine learning approach has been developed to demonstrate patterns of violence on the ground. This is allowing the ICRC to monitor the impact of its actions and also facilitates decision-making. Teams from EPFL and the Geneva University Hospitals have developed a new AI algorithm that will be integrated into a smart stethoscope to better manage respiratory diseases in more isolated or low-resource areas of the world.

To further progress in the quantum field, the US agency Intelligence Advanced Research Projects Activity (IARPA) has awarded substantial funding to two projects in which ETH Zurich and PSI are participating. These projects have the extremely ambitious goal of connecting two corrected qubits. Error correction in quantum computing helps preserve information by protecting it from errors induced by decoherence and other interference. Connecting two qubits after correction remains one of the major hurdles to advancements in quantum technologies. In the same area of research, an Empa research group with researchers from Beijing University and the University of Warwick has succeeded in attaching electrodes to atomically precise graphene nanoribbons, paving the way for the potential use of these ribbons in quantum technology.

In information technology and microtechnology, miniaturisation is becoming increasingly relevant. In collaboration with University College London, a PSI research group has taken an important step towards further miniaturisation of microchips. With the help of SLS, it has succeeded in creating the smallest structures ever described with photons without using a light-sensitive layer. Researchers from Empa, ETH Zurich and the Politecnico di Milano have developed a new type of computer component that is more powerful and easier to manufacture than its predecessors. Like the human brain, it has the distinctive characteristic of being able to process large amounts of data quickly with great energy efficiency.

The ETH Domain has made considerable efforts in the field of space research and innovation. The expansion of the ETH Zurich | Space initiative and the appointment of Thomas Zurbuchen was one of the highlights of 2023 (see Report, p. 16). The establishment of the European Space Deep-Tech Innovation Center (ESDI) at PSI in collaboration with the ESA is also well underway (see Objective 6, p. 73). In addition, there are many other projects being carried out within the institutions. For example, scientists from Eawag are involved in the MELiSSA (Micro-Ecological Life Support System Alternative) space research programme, which aims to develop a life support system for long-term space missions. PSI will also lead an EAER-supported project for multidisciplinary space research activity and innovation. The project, called openSPACE, is being run as a team effort with ETH Zurich and ALMATECH SA, and aims to create a European nuclear simulation platform that will be used for space applications and conceptual assessments.

Targeted studies on climate change and biodiversity are also essential to society. For example, through their studies on tree rings, WSL scientists have been able to demonstrate that the medieval climate anomaly (an unusual period of mild weather around the year 1000) was not as warm as previously thought, while current warming is beyond the natural changes observed in the past. In cooperation with the University of Zurich and Agroscope, other WSL scientists have shown in a study that soil is the most species-rich habitat on the planet. An Eawag study is investigating indicators of the dynamics of biodiversity based on the development of lakes over the past 10,000 years.

As Switzerland is considered a third country not affiliated with the Horizon Europe programme, as it stands, researchers based in Switzerland cannot respond to calls for proposals for the prestigious ERC Grants. However, they were successful in their response to calls for projects launched by the Swiss National Science Foundation in 2023 within the framework of transitional measures. Research institutions in Switzerland also have the opportunity to participate in the European ERC Synergy Grants. This is European research funding designed to fund collaborative projects involving two to four researchers. ETH Zurich and EPFL are involved in two projects, each of which were awarded an ERC Synergy Grant in 2023. The projects are being carried out in collaboration with European partners and cover the following areas: neuron regeneration, cryo-microscopy, sensors used in the Internet of Things (IoT) and high-pressure hydrogen combustion.

The institutions of the ETH Domain are also involved in national funding programmes such as the National Centres of Competence in Research (NCCRs) and the National Research Programmes (NRPs). Of the 14 NRPs active in 2023, eight were under the leadership or co-direction of ETH Zurich or EPFL. The ETH Domain is also expected to feature prominently in the call for proposals for the sixth round of NRPs, issued in 2023.

Both international rankings and the numerous awards, prizes and research grants awarded to researchers testify to the excellence of the ETH Domain (see also University rankings, p. 101). Distinctions at national level include the Watt d'Or 2023, rewarding the best energy projects of the previous year, awarded to Arno Schlüter for the adaptive solar façade installed on the NEST, and the Swiss Grand Prix for Art, the Meret Oppenheim Prize 2023, which went to the Parity Group initiative of ETH Zurich. The 2023 Swiss Latsis Science Prize was awarded to physicist Lesya Shchutska for her research into as yet unknown particles, and the Cloëtta Prize, which rewards medical research, went to Tanja Stadler and Barbara Treutlein. This is all in addition to numerous international awards.

Footage with drones gives WSL's forest experts the necessary spatial resolution to be able to investigate the processes of individual trees or tree species in the forest (see also Report, p. 26 et seq.).

Likewise, bibliometric studies offer the opportunity to assess the scientific excellence of institutions from the point of view of their publications. The bibliometric study carried out as part of the 2023 Interim Evaluation of the ETH Domain has been published on the ETH Board website. The study shows that 18% of ETH Domain publications are among the top 10% of the most cited publications in the world. The study also shows that ETH Domain publications very often appear within the framework of international collaborations. The prevalence of open publications has grown steadily in recent years, and the impact of these publications is higher than that of traditional publications.

Complementary expertise within the ETH Domain

Joint initiatives are tools that have been established as part of the ETH Domain's strategic priorities for the 2025–2028 period (see Objective 5, p. 68). For instance, the Swiss Center of Excellence on Net-Zero Emission (SCENE) pools the expertise of more than 30 research groups and offers a platform for interdisciplinary and inter-institutional collaboration. The SCENE initiative works closely with the joint initiative SPEED2ZERO, which, likewise, conducts research with a view to achieving net-zero CO_2 emissions. Some of the joint initiatives cover several strategic priorities. Take, for example, the E3TOTO initiative (Engage Everyone with Energy – the Topic of Today) with its strategic focus "Engagement and Dialogue with Society", which opened the "Experience Energy!" exhibition at the Swiss Museum of Transport in Lucerne.

Several research projects are also underway within the framework of Eawag and WSL's Blue-Green Biodiversity initiative, which was initially supported as a cooperation project by the ETH Board with funding from its free reserves. The ENRICH initiative is another central tool adopted by the research institutes to strengthen their cooperation in certain scientific fields, as well as to coordinate themselves optimally in certain sectors of activity (see Objective 5, p. 68).

Research activities in the energy sector

ETH Zurich and EPFL launched the Coalition for Green Energy & Storage (CGES) in 2023 in collaboration with PSI and Empa along with partners and donors from science and industry. This is another relevant example of how complementary expertise is pooled both within the ETH Domain and beyond. This initiative aims to develop scalable solutions and put in place an ambitious infrastructure for achieving an independent and climate-neutral energy system. Joint initiatives falling under the Strategic Areas "Energy, Climate and Sustainability" are also among the ETH Domain's flagship activities in the energy sector. Finding solutions to energy challenges requires drawing on all existing research and innovation capacities and creating synergies. It was with this in mind that EPFL initiated the Solutions4Sustainability programme in 2023, encouraging the entire EPFL community to submit proposals for sustainable solutions aimed at reducing our carbon footprint and our dependency on fossil energy sources. For example, one of the research and innovation projects aims to capture and recover the CO_2 emitted by the Enevi incineration plant in Valais. The "Energy Future 2050" project saw Empa partner with the Association of Swiss Electricity Companies (AES) to model the energy system in Switzerland, taking into account not only all energy sectors, but also neighbouring countries. The institutions also participate in Innosuisse's various Flagship initiatives related to energy and decarbonisation and continue to play a central role in the SWEET (SWiss Energy research for the Energy Transition) funding programme.

Enhancing computer sciences and information technology

Digitalisation is heavily influencing the way we work, and this includes scientists' approaches to work too. For instance, Empa now uses the openBIS system developed by ETH Zurich. This data management system facilitates the processing of research data across the entire life cycle – from recording to analysis and archiving. As for ETH Zurich, it has launched a network called the Data Stewardship Network (DSN) to connect employees working on research data management. This network aims to facilitate collaboration between experts in this field and those who provide support to research groups, institutes and departments at ETH Zurich.

ETH Zurich and EPFL's contribution to the training of primary and secondary school teachers in computer science and computational thinking is described in more detail under Objective 1, pp. 51–52.

Protection against cyber risks

The Swiss Support Centre for Cyber-Security (SSCC) has significantly expanded its activities with state organisations such as Armasuisse's Cyber Defence Campus, the National Cyber Security Centre (NCSC) and the Swiss Security Network. Through the SSCC, for example, the ETH Domain has been actively involved in the realignment of the National Cyber Strategy published in 2023. The Center for Digital Trust (C4DT), which brings together a number of public and private partners, has continued to grow and a fifth sector has been created to address policy and governance issues. Through the SSCC and C4DT, ETH Zurich and EPFL are also helping Switzerland realign the content and the legislation of the e-ID.

Research priorities

In the reporting period, two clinical studies based on technologies developed in the ETH Domain were organised as part of the Personalized Health and Related Technologies (PHRT) major Strategic Focus Area (SFA) for the years 2021 to 2024. One of these studies, conducted jointly by PSI, ETH Zurich and the University Hospital of Basel, aims to test the effectiveness of a new drug based on a radioactive isotope developed at PSI for the treatment of prostate cancer. In the other, the University Hospital of Zurich will use a method developed by ETH Zurich to evaluate the effect of different drugs administered to patients with myeloid leukaemia. The PHRT initiative will soon be joined by the joint initiatives launched under the 2025–2028 Strategic Area "Human Health", for which the first call for projects was issued in 2023. As part of the ENRICH initiative, the four research institutes hosted several events and workshops aimed at networking, facilitating the exchange of knowledge, and collaborating on existing and future projects in human health research.

Several PHRT projects were carried out in cooperation with the SDSC, a centre established through the "Data Science" SFA. The SDSC supports numerous projects in a wide range of fields, whether in collaboration with academics or other actors. For instance, the SDSC has been working with the SFOE to advance digital innovation in the energy sector, e.g. by helping to develop the Swiss energy dashboard at the end of 2022. This platform makes it possible to monitor Switzerland's national energy supply in high-resolution format.

In 2023, the "Advanced Manufacturing" (AM) SFA continued its "Swiss Advanced Manufacturing Community Events" (SAMCE) series of events, which launched in 2022, to promote inter-institutional exchange and collaboration between young scientists. An industrial workshop was held as part of this in 2023. The AM SFA is also continuing to support several research projects within the ETH Domain. One example of this is the "SCALAR" project, which aims to develop rotogravure printing for industry. The project is expected to strengthen the leading role of Swiss printers and cylinder manufacturers in the field of rotogravure printing.

The ETH Domain pays particular attention to upholding scientific integrity. ETH Zurich has expanded its range of courses in the field of ethics and scientific integrity for doctoral students. The reporting period also saw the Ethics Commission of ETH Zurich publish internal guidelines relating to social media. The research institutes have been encouraging reflection on the impact of ChatGPT and AI on issues of scientific integrity through the organisation of informative events on this topic.

The use of animals in research is another ethical concern within the ETH Domain. In the interests of animal welfare, at ETH Zurich, researchers who carry out neuroscientific experiments on animals can now practice their manipulations on 3D-printed models. The impact of gender bias in research is another important aspect for the implementation of good research practices. This topic was discussed in a plenary session during the annual symposium organised by Eawag, as was the topic of open science, which was also discussed at the symposium. Open science and the accessibility of research data are also central issues for the ETH Domain. A new series of calls for proposals to support ORD (Open Research Data) practices within the ETH Domain was launched in 2023. EPFL held the rotating presidency of the ORD Council, which is responsible for ensuring the implementation of the national ORD strategy, in 2023.

Strategic objective

RESEARCH INFRASTRUCTURES

3

During the reporting period, the institutions of the ETH Domain continued to implement the major research infrastructures listed in the Swiss Roadmap 2019 for the period between 2021 and 2024. Two new infrastructures and four major upgrades within the ETH Domain have also been included in the Swiss Roadmap 2023 for the period from 2025 to 2028. The ETH Domain further continued its commitment to international interdisciplinary cooperation by participating in research infrastructures and networks at the European and global levels.

Operation, further development and provision of large research infrastructures

The ETH Domain owns and operates a unique portfolio of large research infrastructures in Switzerland that are made available to the national and international scientific community. These include, for example, major PSI facilities, digital research infrastructures and large research platforms.

In 2023, a new beamline named "Debye" was commissioned at the PSI's Swiss Light Source (SLS). This beamline, built with the financial support of the ETH Board, EPFL and PSI, will enable researchers to study, with great precision, the materials and systems that are essential for the transition to the energy system of tomorrow. Also at the PSI, services for users of the SwissFEL free-electron x-ray laser have been extended on the ARAMIS beamline: the CRISTALLINA-MX experimental station, which opened in 2022, now allows researchers in structural biology to determine the structure of proteins with a very high degree of precision. An initial call for proposals for experiments in this area was launched during the reporting period.

The PSI's major research infrastructures remain in great demand. The number of users of the research facilities is comparable to that of the previous year, with the exception of the SLS, where this number has fallen by around 15% compared with 2022 due to the decommissioning of the SLS at the end of September 2023 as part of the SLS 2.0 upgrade project (see below). The average availability of the PSI's accelerators is 94.3% for the 2020–2023 period.

In 2023, the use of high-performance computing resources at the Swiss National Supercomputing Centre (CSCS) remained as high as in the previous year. As part of the User Program, which launches two calls for projects per year, the CSCS has allocated resources to a number of new projects in 2023. In addition, around a dozen projects have been given access to the powerful pan-European supercomputer LUMI, a consortium of which CSCS is a member, thanks to the CSCS's annual CHRONOS call for projects. Meanwhile, the "Alps" computer (see also p. 61 et seq.) will help to drive forward the SwissTwins initiative, launched in 2022 by the Federal Council, which focuses on the development and dissemination of software technologies such as the "AiiDA" workflow generator developed at EPFL.

To complement the Federal Government's efforts to consolidate Switzerland's excellent position in quantum technologies, the ETH Board has decided to allocate CHF 10 million for the years 2023 and 2024 to the joint ETH Domain Quantum Technology Network (QTNet) infrastructure programme of ETH Zurich, EPFL and PSI. This programme supports research, development and training in the quantum sciences, in particular by increasing micro- and nanofabrication capacity in the cleanrooms of the three institutions and by acquiring ultra-modern research equipment.

At EPFL, the Blue Brain (BBP) neuroinformatics project has made scientific refinements to complement the regional models of mouse brain tissue, paving the way for their public release.

In addition to large-scale research facilities, the ETH Domain is also developing research platforms and demonstrators to speed up the innovation process. These large-scale projects are being carried out by several research partners in close collaboration with industry. This is the case, for example, with the NEST modular building for research and innovation in the fields of construction at Empa and Eawag. Construction of the new "STEP2" unit began in autumn 2023. It aims to stimulate innovation in the fields of circular construction, industrial and digital manufacturing, building envelopes and energy concepts. A project for a unit to study the interaction between drones, infrastructure and nature is also being developed. Empa's move platform is intended to accelerate the transition to the mobility of the future. A new reactor concept is being developed here for the synthesis of methane from CO_2 and water captured from the atmosphere using a collector from the "Climeworks" spin-off of ETH Zurich. Since 2003, the WSL has been studying the effects of increased soil drought as part of a long-term irrigation experiment in the Finges pine forest in Valais. Now, a globally unique installation with misting nozzles and rain canopies has been added to this experimental system. The aim is to demonstrate the effects of atmospheric drought in comparison to those of soil drought.

Swiss Roadmap for Research Infrastructures: implementation of the strategic projects

The implementation of the ETH Domain's research infrastructures listed in the Swiss Roadmap for Research Infrastructures for the 2021–2024 ERI period continued in 2023.

The SLS was completely shut down at the end of September 2023 as part of the major upgrade project ("SLS 2.0"). The aim is to ensure the continued international competitiveness of the SLS for the next 20 years. Following successful conversion, the SLS will return to service in 2025 as the first national light source of its kind in Europe, enabling future experiments to be performed with even more intense x-ray light (see report on p. 23 et seq.).

As part of the HPCN-24 (High-Performance Computing and Networking) initiative, in 2023 the CSCS developed the software environments for the clusters planned for "Alps", the infrastructure that will replace the "Piz Daint" computer. These clusters – which are like supercomputers dedicated to a specific area of research activity within "Alps" – meet the needs of scientists, particularly with regard to machine learning and climate simulations. An innovative approach, based among other things on cloud technology, will enable optimal use to be made of this new digital computing and data infrastructure, the power of which will now

A water-cooled synchotron radiation absorber within the 18-metre-long vacuum chamber of the new SLS2.0 synchrotron. These absorbers are necessary to ensure that synchrotron light not destined for experimental stations is lost in a specific location and that it does not heat other parts of the vacuum system unchecked (see also Report on p. 23 et seq.).

be multiplied. This enhanced performance will be particularly useful for machine learning, a field that the CSCS integrated into its portfolio in 2023, notably through new partnerships with ETH Zurich's ETH AI Center, the PSI's Scientific Computing, Theory and Data division, and the Swiss Data Science Center (SDSC).

The Catalysis Hub (Swiss Cat+) is an automated, data-driven infrastructure for catalyst discovery and optimisation. Using high throughput experiments combined with artificial intelligence, the project aims to support the development of innovative catalytic processes for renewable energy in Switzerland. After setting up a modern infrastructure and assembling a team of experts, the two "hubs" on the ETH Zurich and EPFL campuses validated the first automated experimental procedures.

During the reporting period, the State Secretariat for Education, Research, and Innovation (SERI) published its report on the 2023 Roadmap for research infrastructures with regard to the ERI Dispatch for the period from 2025 to 2028. The list includes six major research infrastructures of the ETH Domain that are recognised as being of importance to the Swiss and international scientific community. In addition, the ETH Domain is already involved in drawing up the 2027 Swiss Roadmap process, alongside the SERI and other players in the ERI Domain.

Involvement in international research infrastructures

The institutions of the ETH Domain contribute to Switzerland's worldwide reputation as a location for research activity through their participation in international research infrastructures.

The Swiss Plasma Center (SPC) at EPFL is one of Europe's leading centres for nuclear fusion research. The institution also celebrated 30 years of fusion energy research in 2023. The SPC's activities are integrated into and supported by the EUROfusion consortium, which operates on behalf of EURATOM and is pursuing the European roadmap towards a fusion reactor. Its collaboration and infrastructure play a crucial role in the EUROfusion effort and contribute directly to the ITER (International Thermonuclear Experimental Reactor) project. In view of its current status as a non-associated third country, Switzerland is no longer considered by the European Union as a country participating in the construction of ITER.

However, a cooperation agreement has been established between EPFL and the European agency Fusion for Energy, which is responsible for the European contribution to ITER, enabling Switzerland to continue to contribute to the scientific and technological development of the reactor. An agreement with the Max Planck Institute in Germany also allows the SPC to contribute to EUROfusion.

Switzerland is a member of several European research infrastructure networks, including through the participation of institutions of the ETH Domain. The PSI, for example, is contributing to the construction and operation of the European Spallation Source (ESS) in Lund (Sweden). Construction of the two instruments in which the PSI is participating progressed so well in 2023, that they will be able to be completed as early as 2024. The PSI provides research results that will be important for the future operation of ESS. The behaviour of metallic samples of tungsten, a material of interest for ESS, was studied under extreme irradiation conditions using the PSI's Swiss Spallation Neutron Source (SINQ). In addition, the PSI is participating in the EURO-LABS project, a merger of numerous research institutions and universities and, since 2023, has been offering transnational access to some of its particle physics research infrastructures. Since 2023, ETH Zurich and the PSI have been involved in the ReMade@ARI project, a pan-European network of analytical research infrastructures aimed at promoting the circular economy. During the first year of the project, three calls for projects aimed at academia and industry were launched for measurement campaigns at some of the project partners' facilities, including some of the PSI's major facilities. The institutions of the ETH Domain coordinate the Swiss nodes of certain European research infrastructure networks. Examples include the Integrated Carbon Observing System (ICOS), whose Swiss node is led by ETH Zurich and in which the WSL and Empa are also participating, and ACTRIS, a pan-European infrastructure producing data on atmospheric constituents whose Swiss node is headed by the PSI with the involvement of ETH Zurich and Empa.

Strategic objective

KNOWLEDGE AND TECHNOLOGY TRANSFER

4

Current indicators on patents, collaboration agreements and spin-offs underscore the ETH Domain's significant contribution to knowledge and technology transfer, making Switzerland more innovative. During the reporting period, two new technology transfer centres in the field of advanced manufacturing commenced operations. Direct exchange with the public and political spheres also took centre stage. Within this scope, the ETH Domain played an important role in the Federal Government's new concept for involving the scientific community in crises.

Research cooperation with the Swiss business community and the public sector

During the reporting period, the institutions of the ETH Domain registered 187 new patents, 156 licenses, 314 invention disclosures and 26 software notifications (see p. 99). In addition, 496 new collaboration agreements with private businesses and 263 with the public sector were concluded (each at least CHF 50,000, see Fig. 14, p. 100). These key figures represent the entire process from the successful transfer of scientific findings to the development of marketable products. Close cooperation between researchers and business players is a key prerequisite for such transfer activities. Various types of events have been put into place to provide structural support for this exchange. Traditional large-scale events such as the EPFL Engineering Industry Day, which took place in a new format in 2023 following an extended break due to the coronavirus pandemic, cover a wide range of topics. ETH Zurich Industry Day, too, attracted a large audience again in 2023. Empa attended the Canton of Zurich's SME Innovation Day, held at the Innovation Park Zurich, to present models for collaboration with private businesses and the NEST research and innovation building, jointly operated by Empa and Eawag. Together with Empa and CSEM, the PSI delivered new insights into energy storage to Swiss companies in Neuenburg in November 2023, using the format of a technology briefing. Focusing on hardwood innovations, Empa carried out another technology briefing for the Swiss timber industry in the summer. Over a dozen companies were granted a special, direct insight into the world of academia at the EPFL thanks to the one-year KNOVA programme, which was founded in 2021.

The reporting period saw a large number of concrete projects being launched collaboratively with industry players as a result of such contacts. The PSI, for instance, embarked on a research partnership with Hitachi Zosen Inova in the field of process development for power-to-X technologies, and Empa made a significant contribution to the development of an extraordinarily bright phosphor for the watch industry. It is used, for example, in the Swatch and Omega MoonSwatch collection.

The funding agency Innosuisse is an important component of many industry collaborations. Within the scope of an Innosuisse-funded project, PSI researchers are currently working with the company Imerys on

developing innovative carbon dispersions as novel materials for electrochemical cells. Empa is represented in the core teams of several ongoing Innosuisse Innovation Boosters, including those focusing on the EnergyLab and the circular building industry. The KTT offices of the various institutions are responsible for communicating the launch of new Innosuisse programmes, such as "Start-up Innovation Projects" and "Swiss Accelerator", to researchers. The institutions of the ETH Domain are also playing leading roles in the "flagships", which provide funding to innovations that are relevant to large parts of business and society.

They also collaborate with various partners from the public sector. Many of these endeavours are focused on concrete examinations of and improvements to our living environment. During the reporting period, Empa and the Federal Office for Buildings and Logistics (FOBL) jointly analysed the FOBL building park, establishing a circular-construction charter in collaboration with major public and private builders (see also Objective 8, p. 87). Eawag has dedicated itself to tackling the challenges facing cities in the age of climate change and increasing population density. Blue-green infrastructure, i.e., infrastructure centred around increasing water elements and green spaces, constituted a central pillar of the solution-finding process.

Experts from WSL, Eawag, EPFL and ETH Zurich worked with the Federal Office for the Environment (FOEN) and other partners on finding effective ways to implement the revised Water Protection Act, aimed at restoring the natural state of river landscapes. The PSI provided expertise and measuring equipment for a study by the Federal Office of Civil Aviation (FOCA) and the Swiss Air Force that involved first experiments with sustainable aviation fuel.

WSL was involved in an international KTT pilot project. At the invitation of Greenland's Ministry of Mineral Resources, the research institute installed seismic instruments designed for remote areas on a potentially unstable fjord rock-slope in West Greenland in the summer of 2023. The project aims to record seismic signals that provide insights into the dynamics of the slope, alerting researchers to any rockslides immediately.

Lastly, work surrounding the postulate "Securing data transmission for the Federal Administration", accepted during the 2023 autumn session, contributed to ETH Zurich's technology transfer activities. A relevant report by the Federal Council will focus, among other measures, on ETH Zurich's open communications standard SCION as a means of strengthening cybersecurity across its administrative communication networks. ETH Zurich and EPFL researchers also contributed significantly to the implementation of initial measures in the Federal Government's data science strategy.

Favourable conditions for KTT and enterprise

The institutions of the ETH Domain supported its students' and researchers' entrepreneurial ambitions with various advisory services and fellowships.

For many years, the PSI has operated the PSI Founder Fellowship Programme, which supports the launch of spin-offs utilising technologies developed at the PSI. In 2023, two PSI Founder Fellows commenced work on their projects. The Entrepreneur Fellowship Programme introduced at Empa in 2021 has since become well established. The Entrepreneurship course, organised collaboratively with ETH Zurich, took place again after a promising first year. Both ETH Zurich and EPFL offer a variety of opportunities that pave the way to market entry for student initiatives, for example, the well-established Pioneer Fellowships and the Changemaker and blaze programmes. EPFL has recently launched the Future Leaders Platform, aiming to provide students with guidance and support for all things enterprise. In addition, the Start-up Launchpad, which hosts a range of services for EPFL spin-offs, received a visibility boost.

This extensive support network resulted in a record number of new spin-offs in 2023. We have included three of these 69 newly founded spin-offs here (see p. 99). Eawag has given rise to Eclose, a company dedicated to creating value from organic waste in the form of animal feed using black soldier flies. The Empa spin-off BTRY develops solid-state batteries with extremely short charging times (see p. 31). ASTRA Therapeutics, a PSI spin-off, develops medication for parasitic diseases such as malaria and toxoplasmosis, which affect millions of people worldwide every year.

Mining the atmosphere: "Out of thin air" is a major research initiative by Empa to transform carbon from the atmosphere into valuable materials like polymers or construction materials (see also Report on p. 29 et seq.).

National network of technology transfer centres in advanced manufacturing

In the context of the Federal Government's "Action Plan for Digitalisation", the ETH Domain played a key role in the establishment of the association of technology transfer centres in the field of advanced manufacturing (AM-TTC). The first two Swiss m4m Centres, operated with the involvement of the PSI as a research partner, are now receiving federal support as research institutions of national significance. ANAXAM offers companies services in the field of applied material analysis by means of neutron and X-ray radiation at the PSI's large-scale research facilities and continues to be successful. In 2023, the institution worked with an industry partner on analysing the three-dimensional distribution of fibres in fibre-reinforced plastic components to optimise glass fibre structures.

Two new centres were launched during the reporting period: the Swiss Cobotics Competence Center for collaborative robotics, whose research partners include ETH Zurich and EPFL, and the Swiss Photonics Integration Center. The latter is based at Innovation Park Innovaare, and the PSI is a founding partner. It aims to generate expertise and innovative solutions for the integration of optical systems and make them available to the Swiss precision industry.

Strong involvement in Switzerland Innovation

The institutions of the ETH Domain actively support the various sites of the Swiss Innovation Park, which aims to strengthen networking between science and business and create favourable conditions for innovation among entrepreneurs and researchers. In 2023, ETH Zurich underscored its long-term commitment to the Switzerland Innovation Park Zurich in Dübendorf by leasing two former aircraft hangars and their adjacent open-air spaces for research purposes. Sections of one of these halls are already housing lively research activities by ETH Zurich. The conversion of the remaining space will commence in 2024. Research at the facility will continue to focus on mobility and intelligent systems. Empa is participating in discussions about the future positioning and orientation of the Innovation Park Zurich and supports its foundation board and management. At the Park Network West EPFL, the Academia Industry Collaboration programme was developed. It involves eight companies, most of which are based in Canada, Japan, Australia and South Korea. Innovation Park Innovaare celebrated an important milestone on 20 December: after around four years of construction, the extensive and demanding project was completed on schedule, and the operating company innovAARE AG, along with the PSI and other businesses, will be able to move into the new buildings as of early 2024. The complex contains office spaces alongside shockproof, thermally stable research laboratories and clean rooms.

Empa contributed to the establishment of innovation hubs for health, sensors and business at the Innovation Park East during the reporting period.

Dialogue with society and tasks assigned by the Federal Government

Engaging the public in a direct dialogue about socially relevant research topics is an important responsibility of the institutions in the ETH Domain. Research results were shared with the public during various events in 2023. In the autumn, thousands of visitors gathered at Scientifica, Switzerland's biggest science festival, to meet researchers from the University of Zurich and ETH Zurich. The Rethinking Living series by ETH Zurich saw global personalities discuss ideas about the future before a captivated audience. EPFL organised the large, public Scientastic events on its campus to mark its open day. It also hosted "Ma thèse en 180 secondes" and attended various festivals and trade fairs, including tunBern, which focuses on early-career support for young professionals. During the EPFL open day, Empa contributed a booth and lectures about a variety of research topics, such as the future of building. The WSL Institute for Snow and Avalanche Research SLF invited the public to the grand opening of its new workshop and office building in Davos. Many visitors learned about the institute and its research into snow, mountain ecosystems, avalanches and other natural hazards in alpine regions. Marking its double anniversary (25 years of the psi forum visitor centre, 15 years of the iLab pupils' laboratory), the PSI hosted an event titled "Research is Fun" for young and old.

The institutions of the ETH Domain also made their work accessible through media formats, such as videos and books. The four research institutes presented their work and vision to the general public in a new short film called "4RI – 4 our future". It revolves around the common goal of using excellent research to develop innovative, sustainable solutions for current challenges. Eawag produced a video about the students of its analysis and training laboratory, who have been contributing to the National River Monitoring and Survey Programme (NADUF). Empa launched the video and live-stream series 'Bright Minds', which celebrates outstanding researchers and their work. The reporting period also saw the publication of Paul Scherrer's biography "Erzählte Physik".

The institutions of the ETH Domain attach great importance to close dialogue with primary schools and baccalaureate schools as a way of fostering interest in science, technology, engineering and mathematics (STEM) among young people. It continuously widens and improves its established approaches in this field, for example, the EPFL programme "Les sciences, ça m'intéresse!". In 2023, the part of the programme dedicated exclusively to school children was expanded, with activities taking place across French-speaking Switzerland, in the cantons of Lucerne, Zug, Zurich, Basel, Solothurn and Schaffhausen, as well as in Ticino. The EPFL's pre-university weeks gained new topics, such as game theory and artificial intelligence. ETH Zurich's strategic partnership with UBS, which commenced in 2022, has gained traction. Over the coming decade, it intends to carry out funding initiatives for STEM subjects aimed at target groups that have been difficult to reach thus far. The institutions of the ETH Domain also organised special events for primary school students, including Switzerland's first International Chemistry Olympiad, which was held at ETH Zurich and attracted around 900 visitors from nearly 90 countries. Some attendees took advantage of the opportunity to visit the PSI, Empa and Eawag during their stay and gain an insight into the research carried out at these institutions. EPFL welcomed school children from Ticino to its Sportech event at the National Youth Sports Centre in Tenero, where they learned how science and technology can be incorporated into sports and everyday life. The annual PSI event "Lehrberufe à la Carte" gave young people an overview of the apprenticeship trades available at the PSI. Three PSI apprentices celebrated an impressive achievement in 2023: they won medals at the SwissSkills Championships. Two apprentices at the Empa physics laboratory won the national "Schweizer Jugend forscht" competition and will be representing Switzerland at the MILSET Expo-Sciences International in Mexico.

Scientific advisory services for public authorities and political decision-makers on current issues constitutes one particularly dialogue-centric aspect of knowledge transfer. At the structural level, the ETH Domain played an important role in developing the Federal Council's concept for including the scientific community in future crisis situations, announced in December 2023. The central hub for the science-policy interface, founded at ETH Zurich in 2022, gained traction during the reporting period, organising various round tables for administration and research as well as workshops aimed at enabling researchers to communicate effectively with politicians. The autumn of 2023 saw the hub organise a programme dedicated to connecting senior employees of the Federal Administration with relevant research groups at ETH Zurich. ETH Zurich also set up a Science-Policy Advisory Board in 2023 for the ongoing development of projects in collaboration with political and regulatory entities. In collaboration with alliance F, the university also established the Public Discourse Foundation, which seeks to provide advisory services on the issue of hate speech and public discourse online. The four Joint Initiatives in the Strategic Area "Engagement and Dialogue with Society" of the ETH Domain 2025–2028, which were launched in 2022, made further progress during the reporting period (see also Objective 5, p. 68).

Researchers from the ETH Domain contributed to initiatives and exchange events at the interface between science, politics and administration across many platforms. Energy, environment and sustainable development were key topics. The micropollutants process technology platform and water quality platform were launched in 2012 and 2015, respectively, by Eawag, the FOEN, and the association of Swiss wastewater and water protection experts (VSA) to support the practical application of relevant research results. In 2023, this partnership was extended by another four years. Eawag advanced the field of wastewater-based epidemiology during the reporting period, making public health a key focus (see also Report on p. 32 et seq.). It is currently in the process of establishing a competence centre dedicated to this subject. Within the scope of the National Centre for Climate Services (NCCS), WSL launched a new NCCS impact project on the effects of climate change on ecosystem services in Switzerland. Insights from the project are made available to various user groups through a digital dashboard. SLP supported the municipality of Albula/Alvra in monitoring the rockslide in Brienz/Brinzauls. Empa research provided the basis for European and Swiss legislation on circular economy in the automotive industry. In partnership with the Foundation for Technology Assessment TA-SWISS, Empa researchers have examined five carbon removal technologies in terms of their suitability and potential for Switzerland. During an energy briefing event on the topic of Synfuel, politicians and public administrators learned about ongoing research activities and challenges in the field of synthetic fuels. The PSI and Empa jointly organised this briefing with partner companies, environmental organisations and the Federal Office of Civil Aviation (FOCA). Not least, the ETH Domain has established itself as an important role model in the field of energy and climate (see Objective 8, p. 80 et seqq.).

In conclusion, we will outline some current developments regarding the tasks transferred to the ETH Domain by the Federal Government in accordance with the Notes to the Strategic Objectives. WSL and the FOEN are presently carrying out the fifth Swiss National Forest Inventory (NFI). The first interim results show that the extreme weather events of the past years have left clear marks on Swiss forests. The number of dead and damaged trees has increased. What's more, young tree regrowth has diminished. Clearings are now being populated with types of trees that are better suited for the climate of the future. The Swiss Centre for Applied Ecotoxicology, based at Eawag and EPFL, has advanced a major monitoring project aimed at evaluating the quality of waters and sediments. The Swiss Seismological Service (SED) at ETH Zurich presented the first earthquake risk model for Switzerland in 2023. It shows the effect of earthquakes on people and buildings in this country. The PSI is making a significant contribution to maintaining competence in nuclear safety. The master's degree programme in Nuclear Engineering at ETH Zurich and EPFL, much of which is taught by PSI experts, is central to this endeavour. It has been declared an exemplary programme of education and professional development in the field of nuclear engineering by the United Nations International Atomic Energy Agency.

Strategic objective

COOPERATION AND COORDINATION

5

During the reporting period, the institutions of the ETH Domain have closely cooperated with each other and with other Swiss education and research institutions. The Lead Campus continuing education centre represented a milestone for the ENRICH collaborative initiative of the four research institutes. Hospitals as well as businesses and spin-offs were important partners in the field of medicine and medical technology.

Cooperation within and outside of the ETH Domain

The instrument of the Joint Initiatives further boosted cooperation between the institutions of the ETH Domain during the reporting period. Joint Initiatives are large, time-limited collaborative initiatives that typically involve at least two institutions. They are part of the five Strategic Areas for global challenges that the ETH Board has set out in its Strategic Plan 2025–2028. In the two key areas of Energy, Climate and Environmental Sustainability as well as Engagement and Dialogue with Society, a range of Joint Initiatives were approved for implementation in 2022. These gathered pace during the reporting period (see also Objective 2, p. 57 et seq., and Objective 4, p. 66 et seq.). In 2023, calls were launched in the Strategic Areas of Human Health, Responsible Digital Transformation, and Advanced Materials and Key Technologies. The bottom-up initiative ENRICH of the four research institutes also reached a milestone during the reporting period with the signing of the agreement for the Lead Campus. This cross-site Lead Campus – whose name is derived from the words learning and development – will become the shared education centre for the training and continuing education of staff from PSI, WSL, Empa and Eawag from 2024.

Drivers of cooperation within the ETH Domain include long-established formats, such as – with regard to research – the Strategic Focus Areas of the ETH Domain for 2021–2024 (SFAs; see Objective 2, p. 55 et seqq.) and the major research infrastructures (see Objective 3, p. 60 et seqq.). In terms of teaching, the two joint Master's degree programmes in Nuclear Sciences and Cybersecurity form part of the cooperation. The participation of the research institutes in teaching and the joint supervision of doctoral students also plays an important role (see also Objective 1, p. 50 et seq.). For example, a funded professorship in the field of biosensing was set up by Empa and ETH Zurich as well as other partner institutions in the St. Gallen area during the reporting period. Continuing education also offers opportunities for cooperation and capitalising on synergies. The EPFL Extension School and Swiss Data Science Center (SDSC), supported by ETH Zurich, EPFL and PSI, have signed an agreement on joint continuing education courses in the field of data science. With regard to a jointly funded professorship, researchers from WSL and ETH Zurich together launched the first MOOC (Massive Open Online Course) on environmental DNA analysis for the purpose of monitoring and preserving biodiversity in 2023. Not only do the institutions of the ETH Domain work closely with each other, they also work together with various partners throughout Switzerland. For example, during the reporting period, Eawag together with researchers from the Uni-

versity of Zurich studied genotype traces in the groundwater and were able to show that a wide range of organisms leave their DNA traces in the groundwater, findings that can be used in the future to measure the groundwater quality. ETH Zurich and the University of Zurich launched two new projects together in the Wyss Zurich Translational Center thanks to a further donation. One involves the development of an underwater drone and the other a portable neurostimulating medical device for pain relief. WSL launched the INSECT project with the Agroscope and FiBL research institutes, among others. It investigates the impact of climate and land use change on the composition and frequency of insect communities in recent decades. ETH Zurich and EPFL began a special initiative in the summer of 2023 together with PSI and other partners from science, politics and industry: known as the Coalition for Green Energy and Storage (CGES). The aim is to develop scalable solutions for a carbon-neutral and independent energy system and to set up pilot systems (see Objective 2, p. 57). At the structural level, cooperation between the neighbouring institutions is often particularly close. EPFL and the University of Lausanne have renewed and intensified their cooperation agreement in the area of continuing education. The activities of the EPFL Extension School are to be integrated in the Formation Continue UniI-EPFL (FCUE) foundation to ensure consistency and make better use of synergies.

Structure of the Swiss higher education sector

As members of swissuniversities, ETH Zurich and EPFL are closely involved in shaping the Swiss higher education sector. Cooperative projects play an important role here. These are funded by the Federal Government within the scope of the project-related contributions via swissuniversities. All six institutions of the ETH Domain are actively involved in this instrument. The ETH Board provides the means for the involvement of the research institutes centrally. ETH Zurich, EPFL, PSI and several universities as well as universities of applied sciences have initiated a project that aims to tap into the underused potential of women as founders of spin-offs as part of the Diversity, Inclusion and Equal Opportunities scheme. Within the scope of the same scheme, WSL took part in the National Day against Sexual Harassment at Universities on behalf of all four research institutes in the ETH Domain. One objective of the project-related contributions is also closer cooperation between universities and universities of applied sciences at the doctoral level. For example, ETH Zurich, the University of Zurich and the Zurich University of the Arts support the doctoral programme Epistemologies of Aesthetic Practices, which funds dissertations on basic artistic and scientific matters in the field of aesthetics. EPFL and the University of Applied Sciences and Arts of Western Switzerland have signed an agreement to jointly supervise dissertations and to further consolidate cooperation.

The ENRICH strategic initiative led by the four research institutes (4RI) promotes collaboration and complements expertise in specific research areas – all with a view to serving Switzerland in the best possible way and with an ever-present focus on the SDGs.
› ETH Board

The ETH Domain is contributing to the Swiss-wide division of tasks in particularly cost-intensive areas through its research infrastructures, which are available to the entire research community (see also Objective 3, p. 60 et seqq.). Further services from the ETH Domain are aimed at any interested partners in Switzerland, for example the European Space Deep-Tech Innovation Center (ESDI) at PSI in the aerospace field (see Objective 6, p. 73), or the ESA Business Incubation Programme Switzerland, which ETH Zurich runs on behalf of the ESA for all of Switzerland, and for which a record number of start-up applications was received in 2023.

Review of the function and structure of the ETH Domain

The ETH Board is currently reviewing the organisation and structure of the ETH Domain to better equip it for urgent current and future challenges. The aim is to further strengthen collaboration in the ETH Domain and more easily integrate new strategic issues. In the reporting period, representatives of the directorates of the four research institutes and the executive boards of the two Federal Institutes of Technology devised several potential options for the future structure of the ETH Domain, all of which are the subject of ongoing discussion by the ETH Board. The ETH Board is currently devising criteria to be used to evaluate the options and intends to discuss these with various internal and external stakeholders. This will be followed by an internal consultation, which will serve as the basis for strategic decision-making in 2024.

Strategic alliances

ETH Zurich and EPFL work closely with various Swiss technology competence centres and research institutes funded by the Federal Government within the framework of strategic alliances. This cooperation includes both teaching and research as well as knowledge and technology transfer. ETH Zurich maintains, for example, a strategic alliance with the inspire AG centre of excellence for technology transfer to the mechanical, electrical and metal industries; EPFL with the Swiss Center for Electronics and Microtechnology CSEM and Idiap, the research institute specialising in artificial intelligence, among others. The latter received a new director during the reporting period. Andrea Cavallaro was also appointed professor at the EPFL School of Engineering and will further develop the already major role of Idiap and EPFL in the field of data science and machine learning. In 2023, EPFL established a steering committee with both Idiap and CSEM to consolidate implementation of the alliance at a strategic level. Continuing education in digitalisation and technological design is considered a new cooperation opportunity between Idiap and EPFL.

Another success was recorded in photovoltaic research (solar cells with over 30% energy conversion efficiency) at CSEM in collaboration with EPFL during the reporting period. An evaluation of the CSEM commissioned by the State Secretariat for Education, Research, and Innovation (SERI) and published in 2023 noted that cooperation with EPFL within the scope of the strategic alliance was very good and should be even more widely publicised.

Activities in the areas of medicine and medical technology

Close cooperation between Swiss hospitals is central to the medical technology research of the institutions of the ETH Domain. Together with ETH Zurich, Empa, the canton of Aargau and the Aargau hospitals, PSI planned a programme for funding cooperation between doctors and researchers from the ETH Domain during the reporting period. The aim of the programme is to incorporate everyday clinical experience into research projects at an early stage. Fondation Botnar donated a further CHF 50 million to ETH Zurich and the University of Basel to add six new professorships to the joint Botnar Research Centre for Child Health, which works closely with the University Children's Hospital, both of which are in Basel. In Schlieren, ETH Zurich rented a new laboratory building for medical research right beside Schlieren Bio-Technopark. The research environment is ideal, as the medical research of University Hospital Zurich is based on-site, as are many of ETH Zurich's medical spin-offs.

During the reporting period, Empa initiated a new cooperation with Kantonsspital St. Gallen, not least to develop in-vitro cancer models; Empa has also begun new collaborations with the University Hospital and the Children's Hospital Zurich in the field of antibiotic resistance. With the aim of reducing lung complications that often occur with conventional radiotherapy, the PSI's Centre for Proton Therapy was the first to treat a patient with oesophageal cancer with protons. Similarly, in Western Switzerland, the traditionally close cooperation between academia and hospitals was further consolidated.

The EPFL signed framework agreements in data science with Vaud University Hospital CHUV and the University of Lausanne as well as with the HUG University Hospitals of Geneva and the University of Geneva. These will amalgamate the competences of the Biomedical Data Science Center of CHUV and HUG with those of SDSC and thus improve the quality of treatment and the positioning of the region in the field of precision oncology. EPFL has also joined the Swiss School of Public Health (SSPH+), linking the academic institutions for public health with epidemiology. This signals its willingness to play a pioneering role in these fields. Pharmaceuticals companies are important partners for medical research in the ETH Domain. In 2023, ETH Zurich and Roche launched calls for a joint research programme in which up to 20 doctoral students and postdoctoral researchers will work on the development and application of cell-based and gene-based human model systems and conduct research into new treatments in the next three to four years (see also Objective 1, p. 50). The partnership with the Roche Institute of Human Biology started at EPFL, by virtue of which several professorships have been set up.

Finally, ETH Zurich and EPFL are also active in the training of young medics, not least through the Bachelor's degree programme in Human Medicine at ETH Zurich. During the reporting period, ETH Zurich also commenced talks about a joint doctoral programme in medicine with the Università delle Svizzera Italiana USI. EPFL is planning more active communication to make its students more aware of the possibility of the gateway to the Medical Faculty of the University of Lausanne.

Strategy for the sites of the institutions of the ETH Domain

In order to ensure a coherent strategic approach and identify challenges early on, the ETH Board adopted a strategy for the associated sites of the institutions of the ETH Domain in 2022. The strategy, relating to the sites established after 2006, is due to be implemented before the end of the next ERI period, and also applies to all future associated sites. In the first step, existing evaluation processes are currently being reviewed to identify which ones can be used to implement the strategy.

Strategic objective

INTERNATIONAL POSITIONING AND COOPERATION

6

In 2023, the ETH Domain institutions actively pursued their commitment to maintaining their global importance and attractiveness. They consolidated their international alliances and collaborations, and were also strongly committed to initiatives in favour of peace, humanitarian action and sustainable development. Lastly, the ETH Domain contributed its expertise in globally significant technological fields, such as artificial intelligence and quantum technologies, to promote the responsible and reliable development of these technological advances.

Attractiveness of the ETH Domain

The attractiveness of the ETH Domain stems, among other things, from the importance that its institutions attach to academic excellence and freedom, the unique ecosystem of research infrastructures and platforms (see Objective 3, p. 60 et seqq.) available to researchers, and the development and continuation of major collaborative initiatives and centres of international standing (see Objective 2, p. 55 et seqq.). The ETH Domain works hard to ensure that its reputation, which is based in part on its international positioning in relation to the European Union's research and innovation programmes, does not decline despite Switzerland not being included in the Horizon Europe framework programme.

To further enhance their attractiveness and visibility abroad, the ETH Domain institutions award scholarships to international talent, for example as part of the Eawag Partnership Programme (EPP), which has awarded six scholarships to students from emerging countries every year since 2008. In 2023, the WSL welcomed a number of experienced scientists from research institutions around the world through the Visiting Fellow programme, which offers fellowships each year that enable international researchers to pursue part of their work at the WSL. EPFL gives the most highly qualified students from prestigious partner universities around the world an opportunity to complete research internships in its laboratories via the Excellence Research Internship Programme. Organising major events such as ETH Zurich's ETH Meets You at the World Economic Forum in Davos not only maintains a dialogue with the public, but also raises the ETH Domain's international profile.

International mobility programmes are key to making the ETH Domain attractive to talented scientists. For instance, the PSI was able to recruit its latest 30 postdocs under the "COFUND PSI-Fellows" scheme in 2023. Unfortunately, after three successful funding rounds, the programme can no longer be continued due to Switzerland's non-inclusion in the Horizon Europe framework programme. Nevertheless, ETH Domain institutions continue to be actively involved in the Marie Skłodowska-Curie Actions (MSCA) Doctoral Networks, which are an important instrument for international mobility. As such, in addition to participating in three networks launched the previous year, the PSI is also taking part in a new network that was

Every year, the Eawag Partnership Program (EPP) awards six scholarships to students from developing countries. Pictured: researcher Nida Maqbool from the National University of Sciences and Technology in Pakistan (left) and Linda Strande from Eawag.

› Paul Donahue/Eawag

successfully evaluated by the European Commission in 2023. All participation is co-financed by SERI.

The ETH Domain's international reach also revolves around creating a teaching and learning environment aimed at a global audience. The institutions regularly host and contribute to international summer schools in collaboration with various institutions in Europe and elsewhere. For example, in 2023, the WSL organised four summer schools on a variety of topics. At the same time, the two Federal Institutes of Technology are continuing their early investment in Massive Open Online Courses (MOOCs). The African Cities Lab project, part of EPFL's Excellence in Africa (EXAF) initiative, has developed an African digital education platform on urban development aimed at a professional audience. The platform has been operational since 2023, after a year and a half of development with university partners across the continent, and offers around 10 online courses. Another EXAF project, co-funded by the Swiss Agency for Development and Cooperation (SDC), aims to facilitate the deployment of digital training in regions with limited infrastructure.

International cooperation

The ETH Domain's global network of institutions includes academic institutions, industrial partners, international organisations and NGOs. The institutions are continually strengthening their existing networks and alliances, while also seeking out new opportunities for international cooperation, guided by strategic considerations, for the benefit of Switzerland.

The ETH Domain institutions stepped up their strategic partnerships with institutions in Europe and the rest of the world during the reporting period. EPFL signed a new partnership in the field of architecture with the Singapore University of Technology & Design (SUTD). In October 2023, ETH Zurich, in collaboration with the University of Zurich, successfully organised a joint symposium as part of its strategic partnership with the University of Tokyo. The PSI is heavily involved with the European BEATS beamline project at the SESAME synchrotron in Jordan, which was inaugurated in the summer of 2023. All SESAME engineers and scientists working on the new beamline were trained at the PSI, among other places. SESAME is the only facility of its kind in the Middle East. The establishment of the European Space Deep-Tech Innovation Centre (ESDI) competence centre at the PSI, resulting from a cooperation agreement between Switzerland and the European Space Agency (ESA) in 2022, took shape in 2023 in the form of essential preparatory work, such as moving into the Innovaare park.

The ETH Domain institutions are members of a number of international alliances and networks. For example, both Federal Institutes of Technology are members of the Global University Leaders Forum (GULF), the International Sustainable Campus Network (ISCN) and the Science Business Network, as well as the European Association of Universities of Science and Technology (CESAER). ETH Zurich joined the League of European Research Universities (LERU) in 2023. The European Commission's "European Universities" initiative, currently in its extension phase, aims to implement a long-term strategy to offer new learning, research and innovation opportunities to all their communities, proposing to open up a new path for tomorrow's universities. ETH Zurich has been part of the ENHANCE alliance of European Universities since 2022. For its part, EPFL remains fully committed to the EuroTech Universities alliance, which brings together six of Europe's top technology universities. In 2023, EPFL joined the EuroTeQ alliance of European universities, building on the many activities already put in place by EuroTech, and aiming to create a common, open campus between the partner universities. These European partner alliances received EU funding for the project through Erasmus+. As institutions from a non-associated third country, ETH Zurich and EPFL received financial support from the Swiss agency Movetia.

The ETH Domain is increasingly committed to peace, humanitarian action and sustainable development through international cooperation. In 2023, ETH Zurich and the United Nations (UN) signed a memorandum of understanding confirming a shared commitment to collaborating more closely on technology-based social innovation issues to address major global challenges. In 2023, EPFL's EssentialTech Centre launched the PeaceTech alliance in collaboration with the United Nations Institute for Disarmament Research (UNIDIR), the Graduate Institute of International and Development Studies (IHEID) in Geneva and the Geneva Peacebuilding Platform. This alliance is intended to harness technological advances to promote peace while at the same time developing strategies to prevent the use of technology for violent purposes.

The centre also coordinates the Engineering for Humanitarian Action initiative in partnership with ETH Zurich and the International Committee of the Red Cross (ICRC). Launched in 2020, the initiative is intended to develop and leverage innovative technologies from the laboratories of ETH Zurich and EPFL to improve the effectiveness of the ICRC's planning and implementation of humanitarian action.

Eawag helped to organise five sessions at the second United Nations Water Conference, which was held in New York and which brought together more than 10,000 participants from 150 member states. Thanks to a study carried out as part of the "AGAGE" (Advance Global Atmospheric Gas Experiment) international alliance, Empa researchers proposed a strengthening of the Montreal Protocol, which controls the use and emission of gases harmful to the ozone layer.

Certain technologies, such as artificial intelligence (AI) and quantum technologies, have particular strategic and political international significance and offer opportunities to support diplomacy. ETH Zurich's expertise was put to good use in a global advisory body on AI set up by the UN in 2023 to study the risks, opportunities and international governance of this technology. EPFL's Center for Quantum Science and Engineering (CQSE) is working with various international key players to contribute to the development of this pioneering technology for the benefit of all, for example by participating, with the Quantum Center at ETH Zurich and the ETHZ-PSI Quantum Computing Hub, in the incubation phase of the Open Quantum Institute, an initiative launched this year by the GESDA Foundation (Geneva Science and Diplomacy Anticipator).

Various bottom-up initiatives enabled the ETH Domain institutions to consolidate international collaboration. For example, as part of a major joint project, Indian and PSI researchers have been able to determine the reason why smog forms at night in New Delhi, contrary to all the rules of atmospheric chemistry. The Greenland-Switzerland Avalanche Collaboration project aims to promote collaboration between avalanche management experts in Greenland and Switzerland. Funded by the Konrad Steffen grant from the Swiss Polar Institute, the project allowed Swiss specialists to travel to Greenland in the winter of 2023 to assess the local avalanche challenges. Observers from Greenland travelled to Davos to take part in training courses organised by the WSL Institute for Snow and Avalanche Research SLF.

Active role in the framework of the bilateral cooperation

On behalf of SERI, ETH Zurich is leading the way for Switzerland's bilateral research cooperation with China, South Korea, Japan and countries in the ASEAN region (Association of Southeast Asian Nations). In this context, ETH Zurich is promoting cooperation and exchanges between Swiss university researchers and their Asian partners through a number of funding instruments. The Transnational Red Sea Center (TRSC), set up by EPFL with the support of the Federal Department of Foreign Affairs (FDFA), brings together EPFL researchers and various academic and political partners working to protect the coral reef ecosystems of the Red Sea. In 2023, the TRSC carried out several scientific missions, notably to Djibouti and Sudan, while also establishing a new collaboration with Eritrea and pursuing various information campaigns to raise public awareness of the region's environmental challenges.

The ETH Domain institutions are strongly committed to the African continent, in particular through the ETH for Development initiative (ETH4D) at ETH Zurich and the Excellence in Africa initiative (EXAF) at EPFL, which was mentioned above. Two types of fellowships put out to tender by ETH4D in 2023 enabled research groups at ETH Zurich to implement innovative research projects on sustainable development and humanitarian action, such as the development of a low-cost test for sexually transmitted infections in Zambia and the creation of a protection framework for digitised conflicts in collaboration with the ICRC. As part of the solution-oriented research projects for development co-financed by the Swiss National Science Foundation (SNSF) and the SDC, Eawag has launched a project to enable and encourage the adoption of waste-based insect farming technologies for feeding farm animals, particularly in Malawi and Uganda.

In this second year of Russia's war against Ukraine, measures to support the student and scientific community affected have been maintained. For example, the ETH Domain institutions have extended the employment contracts for refugees from Ukraine. The two universities also recorded an increase in the number of refugee students. A number of initiatives have been put in place to help the University of Kharkiv so that it can pursue its research and teaching activities.

In general, the ETH Domain institutions are committed to ensuring that they conduct internationalisation in a responsible manner. Against a backdrop of increasing student numbers and demands for international scientific collaboration, the ETH Domain has initiated a risk management coordination system among its various institutions.

Strategic objective

SOURCES OF FINANCING AND ALLOCATION OF FUNDS

7

The ETH Domain is dependent on reliable funding in order to be able to meet its long-term obligations in terms of teaching and research and provide cost-intensive research infrastructures. It is not able to react quickly when basic financial conditions deteriorate significantly. The total federal contribution remains the most important source of financing for ensuring that the ETH Domain can successfully fulfil its mandate and that Switzerland retains its position as a leading country in education and research.

Allocation of funds based on relevant criteria

In accordance with Art. 33*a* of the ETH Act, the ETH Board allocates federal funds (total federal contribution) to the institutions. The allocation of funding within the ETH Domain is governed by Art. 12(2) of the Ordinance for the ETH Domain. The basis for the ETH Board's target agreements with the institutions are the Federal Council's strategic objectives for the ETH Domain, which are tailored to the expenditure ceiling.

When making these annual allocations of funding to the institutions in March, the ETH Board draws upon the budget requests of the institutions, the achievement of goals and the assessment of their academic performance. In doing so, due consideration is given to the institutions' financial burdens for their teaching, research and knowledge and technology transfer (KTT) activities, as well as for the tasks assigned by the Federal Government. The funding effectively available to the ETH Board (budgetary credits) is then decided by the Parliament in December.

Any changes to the funding available are taken into account when allocating funds in March of the following year.

The Federal Assembly approved a total of CHF 2,736m for the 2023 budget of the ETH Domain (FedD Ia of 8 December 2022) (see Fig. 1, p. 78). The funding requested by the institutions of the ETH Domain for the 2023 budget exceeded the available federal funding by CHF 23m. The ETH Board therefore decided in March 2022, and by a supplementary resolution in March 2023, to finance the expenditure surplus from its reserves and allocated the available CHF 2,759m as follows:

It allocated CHF 2,564m for the institutions' base budgets:

- ETH Zurich CHF 1,322m
- EPFL CHF 707m
- PSI CHF 300m
- WSL CHF 62m
- Empa CHF 109m
- Eawag CHF 63m

CHF 180m was allocated for strategic projects of the ETH Domain:

- Research infrastructure/large-scale research projects: CHF 73m
- Strategic focus areas (SFAs): CHF 29m
- Joint Initiatives in the Strategic Areas: CHF 12m
- Climate protection measures for buildings: CHF 10m
- ETH Domain Quantum Technology Network (QTNet): CHF 4m
- Incentive and seed capital funding, other central and various expenses, as well as special funds: CHF 52m

CHF 15m was allocated for the ETH Board:

- Own consumption by the Administration of the ETH Board and Internal Appeals Commission

The budget for 2023 was based on an assumed inflation adjustment of 0.7%, which was considerably lower than the actual annual inflation rate of 2.1%. On the one hand, savings measures were implemented. On the other, the institutions drew on their reserves to cover the costs in excess of the budget.

Development of third-party funding

The total 2023 revenue of CHF 3,967m consisted of the total federal contribution (CHF 2,730m; 69%) and revenue from third-party funding (CHF 1,237; 31%).[1] The ETH Domain's funding basis remains broadly supported, with an increase in third-party funding.

Stable basic funding by the Federal Government for the ETH Domain is of decisive importance for meeting the Swiss economy's great need for highly qualified specialists and recruiting skilled staff at all levels. This long-term financial support makes it possible for the institutions to remain competitive when it comes to recruiting top talent. The advancement of teaching and research, as well as building construction and conversion projects, requires long-term planning and has to be carefully coordinated with the teaching and research areas affected. Students and doctoral students need to be able to complete their education without any cuts in quality.

The diversification of the funding basis can be seen in the steadily rising proportion of total revenue that is made up by revenue from third-party funding (see Fig. 2, p. 78). This underscores how revenue from third-party funding is becoming increasingly important for the ETH Domain. Researchers at Swiss universities are currently able to participate in only a portion of the Horizon Europe research programme, since Switzerland has the status of a non-associated third country. It is not yet possible to predict whether the transitional measures adopted by the Federal Government will be able to completely cover the financial gap that has arisen from the EU FPs. This circumstance thus has an impact on the proportion of revenue from third-party funding.

Compared with 2022, revenue from third-party funding rose by CHF 151m (2022: CHF 1,086m). All revenue categories recorded growth. This includes the revenue financed through transitional measures, which amounted to CHF 61m in 2023 (2022: 18m; see p. 110 and the Financial Report 2023).

About 40% of the revenue from third-party funding originated from competitive projects with national research funding (SNF/Innosuisse: CHF 335m; 2022: CHF 313m) and with European research funding (Horizon 2020, ERC grants, Horizon Europe: CHF 149m; 2022: CHF 154m). Other significant sources of funding are cooperation with the business sector (CHF 140m; 2022: CHF 136m), funding for research projects from the Federal Government (policy research: CHF 92m; 2022: CHF 87m) and cooperation projects with the cantons, communes and various international organisations (CHF 106m; 2022: CHF 105m). Other third-party funding included donations and bequests (CHF 159m; 2022: CHF 138m), tuition fees and revenue from continuing education courses (CHF 61m, 2022: CHF 58m), various service revenues (other revenue: CHF 155m, 2022: CHF 146m) and net financial income and income from participations (CHF 38m, 2022: CHF –51m).

The presented revenues do not correspond to the third-party funding obtained in the reporting period but rather to the annual progress made in the projects financed with third-party funds. For an overall assessment of the development of third-party funding, see the 2023 Financial Report of the ETH Domain.

The attracted research projects must be consistent with the core mandate and strategy and be able to be carried out to the extent financially feasible so that the base budget is not jeopardised. With third-party-funded projects, the incurred indirect costs are netted, where possible, and inflation is passed on. Contributions toward indirect research costs serve to partially cover costs that the institutions incur from research projects. Overhead contributions for projects funded through transitional measures are about 10% lower than for projects funded by the EU. This results in uncovered costs.

Maintaining teaching and research freedom

The acquisition of third-party funding by the ETH Domain is regulated by the ETH Act, the ETH Ordinance, and by various directives and guidelines at the level of the ETH Domain and the institutions. Compliance is monitored continuously. The two Federal Institutes of Technology and the four research institutes guarantee freedom of teaching and research by ensuring that the research results of third-party funded projects can be published and that the publication freedom of funded persons and projects is assured at all times. Research freedom and the right to use research results are enshrined in the strategy for knowledge and technology transfer and in internal directives, and are also regulated in the research contracts with the donors. In addition, the handling of donations is regulated explicitly by directives.

Increase in efficiency and use of synergy effects

Significant efficiency gains and synergy effects are generated from joint projects and from jointly used research infrastructures and platforms. Examples include the projects of the SFAs and the ENRICH programme of the four research institutes, which evalu-

[1] This refers to the total federal contribution of the Federal Government as accounted for in the consolidated financial statements of the ETH Domain (financing contribution of CHF 2,535m and the federal contribution to accommodation of CHF 195m). On the other hand, the two approved loans, which are credited to the expenditure ceiling, amounted to CHF 2,736m (financing contribution or operating credit of CHF 2,535m and investment credit of CHF 201m).

Fig. 1: Allocation of funding to the institutions of the ETH Domain (after taking into account the reallocation in credit/funds in 2023)

CHF millions	2019	2020	2021	2022	2023	Δ 2022/2023 abs.	Δ 2022/2023 %
ETH Domain [1, 2, 10]	**2,581.2**	**2,596.1**	**2,600.1**	**2,666.2**	**2,736.2**	**70.0**	**2.6**
ETH Zurich [3]	1,298.1	1,314.9	1,316.3	1,349.3	1,372.6	23.3	1.7
EPFL [4]	664.8	698.4	712.1	725.7	747.5	21.8	3.0
PSI [5, 6]	309.8	315.1	336.5	340.5	346.5	6.0	1.8
WSL	57.7	59.4	63.2	65.3	64.8	−0.4	−0.7
Empa [7]	115.7	114.8	126.9	119.9	126.2	6.3	5.3
Eawag [8]	60.5	62.2	62.2	62.8	67.1	4.4	6.9
ETH Board [9]	74.7	31.3	−17.2	2.8	11.5	8.7	309.0

Additional information on the 2023 budget/financial statements:

1 Total allocation of funds in 2023.

2 Annual tranches in accordance with the approved expenditure ceiling for 2021–2024 (credits taking into account the expenditure ceiling): annual tranche for 2023: CHF 2,736m/federal decree (FedD) on the budget according to FedD Ia for 2023 and ceiling-increasing FCD in June 2022: CHF 2,745m.

3 Including upgrade of the Sustained scientific user lab for simulation-based science at the CSCS (HPCN-24): CHF 23m, development of the SwissCat+: CHF 2m, ETH Domain Quantum Technology Network (QTNet): CHF 4m.

4 Including the neuro information technology project, the Blue Brain Project: CHF 22m, development of SwissCat+: CHF 1m, ETH Domain Quantum Technology Network (QTNet): CHF 1m.

5 Including upgrade of the Swiss Light Source (SLS 2.0): CHF 25m, Quantum Matter and Materials Discovery Center (QMMC): CHF 3m, CHART project: CHF 1m, ETH Domain Quantum Technology Network (QTNet): CHF 1m.

6 Including special funds (CHF 11m).

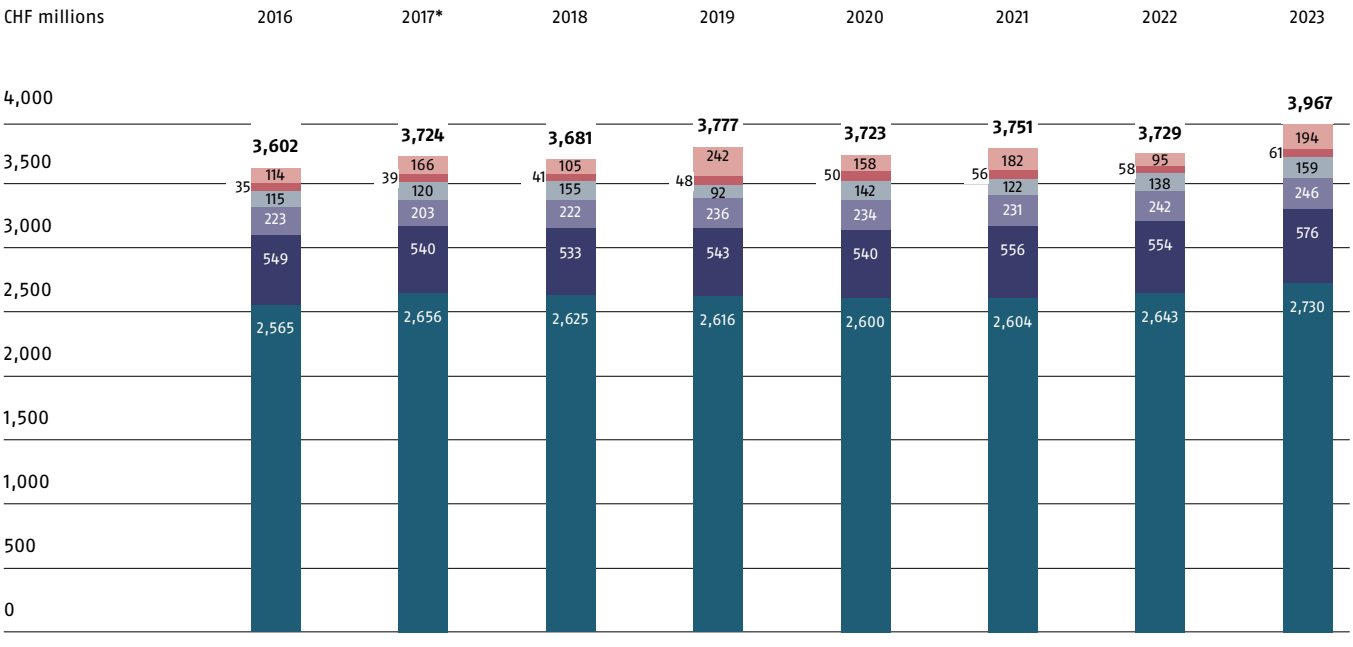
7 Including Empa Site Masterplan (CHF 8m), start-up funding Director (CHF 4m).

8 Including start-up funding Director (CHF 3m).

9 Including strategic projects, financing the dismantling of accelerator systems at the PSI (CHF 11m); reporting period 2023: the low revenue of CHF 11m takes into account that CHF 23m of funds allocated in 2023 were financed from the reserves of the ETH Board.

10 Including strategic focus areas (Personalized Health and Related Technologies, Advanced Manufacturing, Data Science): CHF 29m, Joint Initiatives in the Strategic Areas: CHF 12m, climate protection measures on the buildings: CHF 10m.

Fig. 2: Change in revenue 2016–2023



2016–2023
Total federal contribution

* including sub-consolidation ETH Zurich and EPFL from 2017.

Third-party funding:
- Research contributions from the Federal Government and the EU
- Research contributions from the private sector, other cooperation projects
- Donations and bequests
- Tuition fees, continuing education
- Other revenue

ates and strengthens cooperation in select scientific fields (e.g. net zero, sensors), the activities concerning sustainable development of the campus, and the coordination of complementary offers and services, such as the continuing education programme at the "Lead Campus", an education centre established jointly by the research institutes that will begin operations in 2024. In addition, the four research institutes have been jointly operating their scientific library Lib4RI for a number of years. ETH Zurich and EPFL are generating positive effects with various platforms shared by their researchers. On the one hand, the shared use of equipment greatly increases the degree of its use. On the other, the pooling of equipment makes it possible to optimise investments and save costs. The Swiss Data Science Center (SDSC), which is jointly operated by EPFL, ETH Zurich and PSI, makes it possible to concentrate skills in the key area of data science. It is also available for use by other research institutes as well as by universities and industry. Synergies are also generated with research cooperation partners outside the ETH Domain, such as with the Dubochet Center for Imaging, a joint initiative of EPFL and the University of Lausanne, or with the AGORA Translational Cancer Research Center, a joint partnership of EPFL, the University of Lausanne, the University of Geneva and the university hospitals in Vaud and Geneva. The partnership between ETH Zurich and Roche fosters the next generation of researchers in the field of translational bioengineering with the goal of advancing the frontiers of modern medicine.

Joint benefits are also achieved through various administrative and logistical activities. The reporting platform SAP FC, which is used by the entire ETH Domain, has proved effective. When new accounting standards are introduced, a coordinated, cross-departmental procedure is likewise specified. All institutions contribute human resources to the IPSAS competence centre responsible for this. Coordinated procurement within the ETH Domain (KoBe ETH+) and the online procurement platform P4U used together with the University of Zurich likewise achieve significant savings. At ETH Zurich, many administrative processes were able to be thoroughly digitalised on the basis of SAP S/4 Hana. The other institutions are also vigorously forging ahead with their digitalisation projects. This not only makes the organisation more efficient, but also more resilient to events such as a pandemic.

Reserves

In the context of the strategic objectives 2021–2024 set by the Federal Council for the ETH Domain, the Federal Council expects other equity (sum of the reserves with internal dedication, the reserves without dedication and the accumulated surplus) to be reduced by at least 10% by 2024. Donations, bequests and reserves from associated entities are excluded from the strategic objective. They must be used in accordance with the donors' external specifications.

The reserve target, other equity, amounted to CHF 1,402m at the end of 2019 and to CHF 1,346m at the end of 2023. The value at the end of 2019 constitutes the baseline figure for the reduction target. Since then, the reserves with internal dedication and reserves without dedication have been reduced by CHF 351m, which was offset by an increase in the accumulated surplus of CHF 295m. The increase includes, inter alia, one-off effects in previous years amounting to some CHF 60m. The details on the use of funds from the reserves are published in each case in the Financial Report of the ETH Domain.

The ETH Domain reserves have been managed actively for years. As part of its reserve policy, the ETH Board issued guidelines on this topic for the ETH Domain in 2019. The institutions regulate the operational reserve management through internal directives and regulations. The targeted appropriation of reserves for determining strategic areas in teaching and research and realising large-scale research infrastructure is integrated into the institutions' budgeting and planning processes. The solid total federal contribution by the Federal Government and sufficient reserves facilitate strategic and financial freedom of action. This flexibility is indispensable to the ETH Domain so that it can prevail in the internationally competitive fields of education, research and innovation. Long-term, sustainable funding policies on the basis of multi-year financial planning, balance sheet management focused on the long term and contemporary financial governance also make an important contribution. This ensures that the reserves and all financial resources are appropriated in a sustainable manner in accordance with the strategy.

Dismantling and disposal of accelerator plants

Radioactive waste arises from the use of nuclear energy and ionising radiation applications in medicine, industry and research (MIR waste). The Nuclear Energy Act and the Radiation Protection Act set out the requirements for disposal. The financing of the provision for the decommissioning of the PSI accelerator plants (CHF 449m) will be provided by means of annual savings which will be added to the financing contribution. By the end of 2023, the savings amounted to CHF 62m (CHF 11m of which was saved in 2023). PSI has so far used around CHF 13m (CHF 3m of which was used in 2023) of the accrued savings for measures in connection with decommissioning.

Strategic objective

REAL ESTATE MANAGEMENT AND SUSTAINABILITY

8

Despite the persistent uncertainties concerning the global security situation and economic development, inflation has begun to trend more moderately again. However, several major contracts had to be awarded under pricing terms that remain high. Two new buildings at ETH Zurich completed and opened for teaching and research work. The institutions of the ETH Domain developed individual strategies for besoming CO_2-neutral from 2040.

Strategy and long-term portfolio development

The implementation of flexible working methods in connection with the "Change concept concerning desk sharing for the ETH Domain" has an impact on long-term planning of the real estate portfolio. Implementation will primarily focus on new construction and renovation projects, but several existing spaces will also be conceptually enhanced, or example through dualuse of teaching and dining spaces as student work spaces. The sustained growth in the number of students and doctoral students (+80% since 2008) was addressed through organisational measures, adjustment of teaching methods and higher utilisation intensity so that space growth could be kept in check (+24% since 2008). On the other hand, high energy prices and supply difficulties relating to building components and materials are delaying the planning and execution of construction projects, as well as making them more difficult and more expensive. The simultaneous fulfilment of the tasks of the Federal Government (maintaining value and functionality, sustainability, building culture) and the requirements stemming from research, teaching and KTT remain challenging under these circumstances with the available funding.

At **ETH Zurich**, dynamic changes in academic planning (changing needs of the core business) are being tracked by the individuals with portfolio responsibility for the departments and organisational units, and offers are adjusted where necessary as a result of basic financial conditions. The project "Partial strategy on changing needs and offers, portfolio strategy" is currently being implemented. In it, a calculation model, among other things, is being developed for changing needs and offers that has been coordinated with all relevant stakeholders. Initial results are expected for 2024.

The key driver remains the anticipated growth in the number of students. However, the objective of using existing spaces even more efficiently is being pursued.

The potential space that was held out as a prospect to ETH Zurich in the Central Zurich University District is no longer available. Due to this change in circumstances, the process to revise the planning was initiated in 2023.

Measures implemented as part of the "Barrier-Free at ETH Zurich" project are continuously resulting in improvements. Accessible learning workspaces have been installed in the ETH Zurich libraries, and buildings like the CHN have been adapted to make them more accessible. Furthermore, as of the 2023 autumn semester, lecture recordings are now automatically subtitled.

At **EPFL**, special emphasis is being placed on the development of teaching and on the effects arising from its new forms, such as MOOCs and DLLs (Discovery Learning Laboratories). The coronavirus pandemic has demonstrated the need to expand considerations about future changes to workspaces, including desk sharing and the consolidation of existing spaces while also considering the topic of sustainability. As a basis for these changes, EPFL calculated the number of workspaces and their use in 2023. The master plan for the renovation and consolidation of the campus is intended to facilitate the creation of guidelines for optimising the use of space. The vision of the advanced science campus was introduced in order to emphasise the potential of laboratories and the possibility of their shared use by various research groups. An academic committee won the contract to design the floor plan of the planned Advanced Science Building with a view to ensuring the most efficient occupancy. The provision of a part of the northern grounds (now athletic fields) that is envisaged for the expansion of the university is currently being negotiated with the City of Lausanne and the Canton of Vaud. The decision to classify the buildings in the first stage of EPFL as Historical Preservation Area 1 (national interest) will likely constitute a limitation on future renovation and at the same time highlight their historical importance.

At **PSI** as well, implementation of the Federal Government's flex change concept (introduction of desk sharing) and the new workplace concept is under way. The relocation of units into Park Innovaare is making it possible to consolidate space in individual areas and freeing up space to allow for repurposing, refurbishments and earthquake retrofitting. Key drivers are coverage of the office and laboratory needs identified in the spatial and financial master plan (SFMP) due to new research activities and professorships, as well as necessary building refurbishments.

The SFMP represents the real estate strategy of **WSL**. At the Birmensdorf location, WSL used a usage and operational concept to examine whether a planned replacement new build was still necessary due to changes in the working behaviour of employees, subsequently deciding to reduce the number of required workspaces with organisational measures instead of using structural measures to create more workspaces.

At **Empa and Eawag**, the joint SFMP also forms the basis for the real estate strategy. The **Empa** building park dates back to a time when it was still a testing institution. The transformation into a renowned research institution in the area of material sciences has not yet been perfected in terms of buildings and infrastructure. With the conclusion of the "co-operate" project, Empa will have largely completed the transformation. The digital planning and construction processes were developed further using the BIM method (Building Information Modeling) along with digital operational processes. In this regard, a strategy was formulated and various guidelines and tools were created. In some departments, like Real Estate and Information Technology, a desk-sharing workspace model was successfully introduced in 2022/2023.

Eawag also worked on implementing the mandate of the Federal Government to establish desk sharing for administrative workplaces in 2023.

No substantial portfolio changes were made in the ETH Domain in 2023.

Real estate management in figures

The purchase value of the ETH Domain's real estate portfolio at the end of 2023 amounted to CHF 8.54bn. In terms of value, this represents about one-third of the entire real estate portfolio of the Federal Government. The book value is around CHF 4.22bn. The ETH Domain uses around 400 buildings on 120 plots of land. The main usable area reported at the end of 2023, which covers 1,067,000 m^2, is up 4.3% compared to 2022. The mix of space (see Fig. 28, p. 106) – consisting of spaces in state-owned buildings for own use and use by third parties and leased spaces in third-party buildings (in m^2 of main usable area since 2014) – shows how some of the growth in recent years was only able to be covered through additional leased spaces. The lease rate of the ETH Domain remains low at 16.0% of the main usable spaces. The growth in leased spaces after 2014 is attributable to the newly defined, statistical allocation of the spaces. Without this effect, there would be a decrease in the spaces used by third parties.

Ongoing and completed projects

The following major ongoing construction projects were continued or completed in 2023: **ETH Zurich** took over the new GLC research building for ETH Zurich in the centre of Zurich, with laboratory and office spaces for the health sciences, from the general contractor (GC) and the building was occupied in stages. Similarly, the new BSS building in Basel was taken over from the GC. Teaching commenced, inter alia, in the completed laboratories. At the Hönggerberg location, construction continued on the new HPQ physics building for quantum physics research. Major projects included the refurbishment of the ML/FHK Machine Laboratory with centralised energy supply for the Zentrum location, the covered car park and forecourt at HG in the centre of Zurich, the refurbishment and expansion with a new HIF building, and the HPT workshop building at Hönggerberg.

At **EPFL**, buildings and technical equipment were comprehensively evaluated with respect to delimiting future refurbishment potential. Furthermore, the university grouped scientific equipment according the focus topics on the campus in order to further optimise infrastructure use. In addition, the legal mandate to

maintain value and functionality in the case of energy projects was implemented by renovating the energy centre and expanding the lake water pumping station.

At **PSI**, execution of the SLS 2.0 project commenced on schedule. In connection with renovation of the roof, an innovative PV system with flexible panels will be installed. Various other roof refurbishments, including PV systems, were initiated at a wide range of existing buildings. The expansion of the ORAB Swiss Federal Interim Storage Facility was completed. The new OBBA office building was occupied in mid-2023. Fit-out of the new Kiwi daycare building started, and a general contractor was hired for the new Quantum Matter and Materials Discovery Center (QMMC).

At the Birmensdorf location, **WSL** examined the spatial requirements for a planned replacement building. Based on the above-mentioned evaluation, organisational measures meant that the new replacement building in Birmensdorf could be dispensed with.

Stage 1 of the joint construction Masterplan **Empa Eawag Campus**, continued on schedule. This includes the urgently needed modern labs as well as cross-campus concepts for transforming industrial areas into part of the research campus. The extensive work on the surroundings that is necessary for this purpose posed a challenge to the entire staff at the campus. Owing to proactive, integral planning, the integration of all relevant stakeholders, and flexible solutions in the event of unforeseen problems, these challenges have been met satisfactorily so far. At **Eawag's** Kastanienbaum location, an office, warehouse and laboratory building called Limnion is scheduled to be built. After being revised in line with the recommendations of the Federal Commission for the Protection of Nature and Cultural Heritage (FCNC), the project was once again blocked by an objection during the reporting period.

Investments and source of funds in 2023

The 2023 investment credit for buildings in the ETH Domain amounted to CHF 214.50m. This is somewhat lower than in the previous year (CHF 224.76m), but higher than the long-term average. Because of construction delays, a credit reallocation of CHF 13.49m (6.3%) took place in 2023 between the investment credit and the federal financial contribution. No dedicated reserves were created. Around 44.6% of the investments were related to new buildings, and 55.4% to ensuring that value and functionality were maintained. Third-party funds totalling CHF 0.21m were used for federal real estate (co-financing). CHF 96.84m was used from the federal financial contribution for investments in user-specific operating facilities that will be owned by the institutions. These investments were supplemented by third-party funding of CHF 1.0m. The total volume of construction authorised by the ETH Domain in 2023 amounted to CHF 299.0m (see Fig. 30, p. 107). The ETH Domain received an accommodation credit of CHF 195.2m in 2023 for the imputed rent on federal real estate. The Source of Funds chart (see Fig. 25, p. 105) shows the sources of funds for the buildings in the ETH Domain since 2014. The annual fluctuations depend on the type of grant and the status of the current construction projects.

Construction programme for 2024

In terms of new construction projects planned in the context of new builds, extensions or refurbishments, the ETH Domain applied in 2023 for the necessary contingent credits with its annual construction programme. The 2024 construction programme totalling CHF 142.1m (total credit), approved by the Federal Parliament on 21 December 2023, includes the following major project: Eawag applied for a contingent credit of CHF 12.1m for the new Limnion building, with laboratories and offices. The building will be constructed at the Kastanienbaum location in the canton of Lucerne and is intended for water and sea research.

A contingent credit of CHF 130.0m was requested for additional real estate projects in the ETH Domain. Accordingly, construction projects costing up to CHF 10m are being carried out, and projects over CHF 10m are being planned.

Maintaining value and functionality

The ETH Board is legally obliged to maintain the value and functionality of the properties of the ETH Domain, and this is in the interest of the Federal Government as the owner of the real estate and of the ETH Domain as the user. Despite the advanced age of some of the buildings and their intensive use, the current condition value of 81.0% determined in 2023 remains high in relation to the new value (see Fig. 26, p. 105). The refurbishment work on the historical building stock is considerable in some cases, leading to challenging projects. Renovation projects in excess of CHF 544.8m are currently included in the 2024 to 2027 real estate

investment plan. They triggered an investment volume of around CHF 111.4m in 2023. In addition, annual maintenance work amounting to over CHF 50m on average was funded from the federal financial contribution. Consequently, the ETH Domain demonstrated that it is using the building stock provided by the Federal Government responsibly and sustainably.

Coordination tasks

In 2023, the Real Estate department of the ETH Board once again coordinated the interests of the institutions of the ETH Domain with those of the Federal Administration in the development of norms, standards and guidelines for the planning, realisation and operation of real estate. This coordination takes place with the participation of the institutions and includes their co-determination and active involvement in this process. The most important topics were structural reforms, the development of individual CO_2 strategies, and environmental and energy-saving measures in view of an imminent energy shortage, which would be a substantial risk for the energy-intensive teaching and research institutions. In the field of sustainability, the Real Estate department has played not only a coordinating role, but also a role in shaping various federal working groups on topics such as digitalisation in the construction sector, building culture, life-cycle costing, energy and the environment (pursuant to the Exemplary Energy and Climate initiative, EEC). Moreover, the ETH Board is a member of the Coordination Conference of Public-Sector Building and Real Estate Authorities (KBOB) and the Office for University Buildings (FHB) of the University Council of the Swiss University Conference.

Governance

The ETH Board and the institutions began preparing long-term plans for the real estate portfolio for the period 2025–2036. The spatial and financial master plans (SFMPs) show how the spatial needs resulting from sustained growth in student numbers, as well as the increasing requirements of the Federal Government as a real estate owner with respect to climate protection, energy, building culture and maintenance of value and functionality, can be covered with limited funding.

During the 2020–2023 period of the Building Culture action plan, the ETH Domain was able to implement three measures: "M4: Announce building culture strategy", "M9: Set minimum standards for building culture" and "M10: Develop building culture as purchaser competence". The action plan period concluded with the successful reporting to the Federal Council. The entire cooling water system at the EPFL campus was regrettably infested unexpectedly by invasive quagga mussels, which are quickly spreading unchecked in Swiss waters and also threatening their ecosystems. This environmental incident has made it necessary to take immediate steps to prevent a total failure of the cooling system, which would have serious repercussions for teaching and research operations and carry the risk of consequential damages. A damage report was made by the ETH Board as the building and real estate authority and submitted to the Federal Government as owner. EPFL, the ETH Board and representatives of the owner are now discussing how to proceed, as well as the reasonableness and financing of damage coverage.

The ETH Board has prepared an audit for the new GLC building project, in which an outside, independent auditor is tasked with answering the question of when and under what circumstances negative developments occurred in the course of the project and how these could have been avoided. Teaching and research operations were able to commence in the building in 2023, but defects have yet to be remedied, and the extent of the added costs is still in dispute.

Strategic real estate management in the ETH Domain

Efficient building infrastructure is a central requirement for enabling both Federal Institutes of Technology and the four research institutes to achieve their targets in teaching and research and to meet the required quality standards. The real estate of the ETH Domain is owned by the Federal Government. The investment credit for construction is earmarked annually in the budget. It appears in the state accounts under the Federal Department of Finance (specifically the Federal Office for Buildings and Logistics, FOBL). As one of the Federal Government's three building and real estate authorities, the ETH Board assumes the ownership role in a fiduciary capacity. It is responsible for the real estate portfolio of the ETH Domain and consults the institutions on strategic real estate management in order to ensure the functionality of the real estate portfolio in the medium and long term and to preserve its cultural value. Needs-based planning, and the timely realisation of new construction projects, conversions and refurbishments, are at the heart of its remit. The preservation of value and functionality is the result of needs-based planning, geared – also in the interests of the owner – towards cost/benefit considerations, as well as corresponding controlling at ETH Board level. The owner is kept abreast of this by way of reports from the ETH Board.

ETH Zurich's new BSS office and lab building on the Schällemätteli site in Basel won the 2023 Iconic Award.
› Achim Birnbaum/ETH Zurich

Sustainability: environment and energy

Individual strategies for reducing CO_2: Milestone achieved

During the reporting period, the ETH Domain made significant progress in environmental and energy management. The implementation of energy- and CO_2-reduction strategies, environmental measures, and raising the awareness-raising among employees and students underscores the commitment to sustainable development. Going forward, the ETH Domain will continue to press ahead with innovative solutions to the environment and energy challenges.

In 2023, the focus was primarily on comprehensive measures to reduce, offset and neutralise CO_2, as well as a strategic orientation toward sustainability and the efficient use of energy. The basis for this is the Federal Council's Climate Package. The ETH Domain is working intensively on refining the concept for CO_2 reduction and offsetting, and it is considering ways to integrate neutralisation projects. The six institutions of the ETH Domain have developed ambitious individual strategies that serve as a guideline for further CO_2 reduction, primarily at the source. This makes the institutions of the ETH Domain pioneers among public sector entities.

In view of the energy shortage risk, the ETH Domain is relying on permanent, voluntary savings, and is at the same time preparing proactively for further reductions in a crisis scenario. With regard to permanent savings, all institutions are looking for and taking advantage of optimsiation potential – for example, at PSI with an Energy Award for employees who have the best ideas for ways to save energy, or at EPFL with the Solutions-4Sustainability fund, which is endowed with CHF 20m (see also Objective 57). The Empa-Eawag campus and the Hönggerberg campus of ETH Zurich are being optimised through heating supply networks, which facilitate exchanges between buildings and processes with heating and cooling needs. At EPFL, all heat energy (for both heating and cooling) will be extracted from sea water and heat exchange systems integrated into the EPFL data centre.

Preparing for imminent shortages helps to ensure energy security for Switzerland but also gradually leads to detrimental effects with respect to a permanent reduction. During the energy and gas shortages of 2022/2023, for example, ETH Zurich switched from natural gas to heating oil, which increased CO_2 emissions. To counter any potential power shortages, ETH Zurich has joined a Swiss-wide pool of emergency power groups. This consortium will serve as part of its winter power reserve. All institutions achieved savings during the reduced operation occasioned by the shortages – for example, by lowering the room temperature, shutting off hot water in the bathrooms and using minimal lighting.

All institutions have an energy commission or energy crisis committee, and they will also strive for further reductions in the coming years and respond with agility to any re-emerging shortages.

Photovoltaic (PV) installations are spreading rapidly. In 2023, about 4.5 GWH of PV electricity was produced in areas of the ETH Domain.[1] The advancement of PV expansion in the ETH Domain in the reporting period covered PV master plans, potential analyses and solar land maps of the institutions of the ETH Domain. Concrete projects include, for example, Eawag's new Limnion building and PSI's SLS 2.0 project. In addition to the expansion of PV installations, other projects are helping to increase energy security: for example, in collaboration with the research group of Professor Wendelin Jan Stark, ETH Zurich is building a hydrogen storage facility in Hönggerberg (demonstration plant/ living lab), and a contractor has been found for a seawater pipeline for the ETH Zurich Zentrum location.

The systematic implementation of energy measures (efficiency, recovery, expansion of photovoltaics) will further reduce dependence on external energy supply.

Joint Initiatives: SCENE and Speed2Zero

SCENE (Swiss center of excellence on net zero emissions; see p. 57)[2] and the SPEED2Zero project[3] act as decisive interfaces between research and operational implementation in the area of the environment and energy. Through these initiatives (see p. 68), the ETH Domain is promoting the implementation of research results into concrete measures. In addition, Empa and the construction directorate of the Canton of Zurich have developed the Circular Building Charter. Twelve of the largest builders in Switzerland have signed it so far, including the joint architectural specialist body of Empa, Eawag and WSL, Bau3FI. These measures are contributing to innovation in the environmental and energy sector.

Climate-friendly behaviour is being promoted through targeted measures to raise awareness among staff and the ETH Zurich community, particularly in the area of mobility. ETH Zurich is making a successful push toward sustainable mobility with the Smart Moves campaign. EPFL has created a mobility master plan and defined measures for business and commuter traffic. In addition to general and half-price passes for public transportation, Eawag is also financially supporting commuter passes as well as bike-sharing offers at all locations. Air travel has already been restricted by relevant directives and rules.

Another area of awareness-raising is the catering in the cafeterias. All institutions now offer a higher proportion of vegetarian products. In addition, WSL holds Environment Weeks that focus on lowering CO_2 emissions through the way we eat.

Other areas in which the emphasis is placed on reducing CO_2 emissions include laboratories, such as the Green Lab initiatives of ETH Zurich and EPFL, and the CO_2 reductions that have been announced for procurements at both universities.

As part of this awareness-raising campaign, EPFL and PSI are pointing their employees in the direction of tools they can use to calculate their own personal CO_2 footprint. Awareness-raising campaigns sometimes also support incentive taxes, for example, at Eawag for air travel and personal vehicle use or at ETH Zurich for replacing personal printers with central printers.

The institutions of the ETH Domain continue to be highly involved with the Exemplary Energy and Climate initiative (EEC), and the ETH Domain has already exceeded the energy efficiency, target for 2030 (2022: −24% compared with 2018/2019). This performance underscores the effort to not only meet minimum standards but also exceed them.

In addition, the ETH Domain concluded the 2020–2023 reporting period with the successful submission of a Swiss Landscape Concept prepared in collaboration with the federal offices to the Federal Council. The ETH Domain's gratifying achievement of its goals, with valuable contributions to the environment and the landscape, documents not only its own progress but also contributes to the national discussion concerning environmentally friendly practices. For instance, the "Green Ribbon", open space on the Empa-Eawag campus is set down in the master plan, the "Plan Climat & Durabilité EPFL, partie Campus" was enacted at EPFL, and various locations of the ETH Domain achieved the recertification of sites by the foundation Nature & Economy.

[1] www.ethboard.ch/environment-energy
[2] www.scene-project.ch
[3] www.speed2zero.ethz.ch
[4] www.cbcharta.ch

Strategic objective

WORKING CONDITIONS, EQUAL OPPORTUNITIES AND YOUNG SCIENTIFIC TALENT

9

The HR policy in 2023 was shaped by lifelong learning and leadership topics; the expansion of leadership tools such as skills-based location analyses, leadership interviews and feedback processes; and the imparting of acquired social and leadership skills and their integration into a collaborative work environment. Other areas of emphasis were diversity and inclusion, as well as pushing ahead with digital workflows.

Promotion of inclusive work attitudes

In 2023, the institutions of the ETH Domain used skills-based location analyses, leadership interviews and feedback processes for the purpose of boosting leadership quality and expanding leadership skills. **ETH Zurich** created the Lifelong Learning Hub, which offers access to a significant amount of educational content in order to integrate learning into daily life at work. For the first time, the university conducted leadership interviews with all newly appointed professors after they took up their positions, defined personal development steps, and developed and imparted social and leadership skills for use at every level. **EPFL** conducted the pilot project Advanced Academic Leadership for Professors, developed a new version of the management programme for doctoral students, implemented a psychometric evaluation tool for selecting staff in leadership positions, created a hiring guide for professors and conducted an online training course on the Swiss Data Protection Act. **PSI** held a two-day management retreat, where the topics covered included employee satisfaction, changes in the work world and strategic development 2025–2028. Various workshops held as part of the Leadership Days addressed the new employee meeting, PSI's ability to change, mental health and experiences with the team charter. The **WSL** continued its systematic and compulsory management training via three-day retreats for its group leaders, and offered tailored training and continuing education on the topics of moderation, ownership and decision-making processes. It also implemented a new time-recording system for actively managing working times. In addition to obligatory training courses such as CAS Leadership in Science and Leadership Incentives, **Empa** conducted leadership forums and a training course on HR processes, recruiting, and coaching for employees in challenging situations. Human resources specialists supported the managers at Empa and **Eawag** and acted as administrative experts, change agents, and operational and strategic partners. Eawag also strengthened internal and external networks in order to expand knowledge transfer between managers and staff.

Working conditions, development and further education

Thanks to digitalisation, **ETH Zurich** was able to make development programmes available to many employees. With the programmes Fit for the New Leadership Role and Advanced Leadership, which features 360° feedback, managers were given assistance in developing social and leadership skills. With the new web page Discover EPFL, **EPFL** made it easier for staff to get access to training courses, such as "Preparing for my professional future", to special communication train-

ing courses and to ECDL (European Computer Driving Licence) certification. At **PSI**, CAS Leadership in Science was developed further for all managers and specialists, and it is being conducted with the other research institutes **Empa**, **Eawag** and **WSL**. The Advanced Academic Leadership Programme (AALP) took place for the second time for managers of the ETH Domain who are suitable for top positions in research and administration, as well as in national and international bodies. Existing processes, like tenure track, the expert development programme and the professional development programme, were continued. At **PSI**, a new format, the Non-linear Career Path Event – organised jointly by the Career Center and the PhD and Postdoc Association (ppa) – was launched. At **WSL**, the focus was on the systematic introduction of tenure-track agreements with performance targets in order to create transparency for scientists, as well as on management development, manager promotion and conducting career coaching sessions. **Empa** focused on individual development plans with a horizon of two to five years for the implementation of effective continuing education measures in order to tackle current and future tasks, as well as on long-term preservation of employability. **Eawag** offered personal coaching for all departmental and group leaders. With the introduction of the Lead Campus, the four research institutes created a joint educational platform with a wide range of offered training courses (see Objective 1, p. 53 and Objective 5, p. 68).

Giving priority to domestic labour force potential

Due to the increasing shortage of skilled workers, the ETH Domain evaluated which incentives are necessary in order to make better use of the domestic labour force potential so as to fill all open positions and be able to employ more staff with a greater number of working hours. The ETH Domain welcomes the return of women after family leave. It also makes it possible to work beyond the standard retirement age where necessary. In general, the ETH Domain takes all steps to give priority to employees living in Switzerland and takes the relevant statutory requirements and recommendations into account. Vacant positions are posted on Swiss jobs platforms and reported to the RAVs regional job placement offices (RAVs). Most of the technical and administrative staff have Swiss citizenship.

Equal opportunities, diversity and inclusion

Projects to address diversity concerns, such as LGBTQIA+, social origin, accessibility and the Respect programme, were expanded at **ETH Zurich** and will be grouped in a new diversity strategy, which is currently being developed, according to their emphasis (teaching, research, non-discrimination, and community and culture). The university held various events on diversity and inclusion, such as inclusive communication, empowerment and equal pay, as well as training courses on unconscious bias. A form for the anonymous reporting of inappropriate behaviour was introduced, and an online course was offered on overcoming unconscious bias. Inclusion and diversity were promoted and made visible by accompanying campaigns and the Diversity Award. **EPFL** revised its Compliance Guide. The topic of inclusion was taken up and illustrated by means of awareness-raising campaigns and presentations by the Equality Office. The Trust and Support Network (TSN) and the Respect Compliance Office (RCO), both of which were newly created to assist with and process complaints, likewise makes clear the importance of the topic. The Competence Centre for Diversity & Inclusion assisted with the set up of an internal LGBTQIA+ network at **PSI**. PSI's confidential advisors, neutral points of contact and confidants for all manner of conflicts, met to exchange ideas and experiences and to offer mutual support. The **WSL** was awarded the "Employers we trust." quality label. It conducted Q&A sessions and formed a diversity board. **Empa** created a steering committee on equal opportunity and diversity. The topics of inclusion, equal opportunity and diversity, increasing the proportion of women in management positions, and processes for identifying, reporting and verifying misconduct were documented in an action plan. The Equal Opportunity Committee at **Eawag** is now structured into three areas of focus – Diversity in Recruitment, Diversity and Belonging, and Visibility and Internal Recognition – in order to deal with hiring processes, selection procedures and gender issues in a more effective and targeted manner. The cross-institutional Competence Centre for Diversity & Inclusion enables the research institutes to address shared topics and make use of synergies. In addition, the ETH Domain has internal ombudspersons, the cross-domain Ombuds Office, the appeal body and a conciliation service required by the Gender Equality Act.

Prevention of bullying, discrimination and sexual harassment

All institutions again worked to raise awareness of bullying, sexual harassment, discrimination, threats and violence. In connection with the Action Week Against Racism and the International Day Against Homophobia, Biphobia and Transphobia, a number of campaigns were organised to enable members of the ETH Domain to acquaint themselves with topics relating to equal rights and diversity, to get involved and to engage in dialogue. The institutions took part in the first Sexual Harassment Awareness Day. **EPFL** introduced an online course on the topic of sexual harassment. The online training seminar "You are not alone. Promoting respect" is part of the EPFL Essentials for new hires. Complaint management was supplemented with two new guidelines: LEX 1.8.3 on Psychosocial Risks and LEX 1.8.1 on the Process for Alerting. Using videos available in the Trust Point Tool, EPFL shed light on psychosocial risks. As a follow-up action to the Respect campaign, **PSI** conducted a survey to determine the degree to which respect is embedded at PSI,

whether staff are aware of the points of contact and which parts of the campaign can be further improved. **WSL** created the platform True Stories – Science F(r)iction, thus made preventing discrimination a point of emphasis. Project groups at **Eawag** overhauled structures, directives and the website with an emphasis on inclusion and gender awareness.

Increasing the proportion of women in management positions

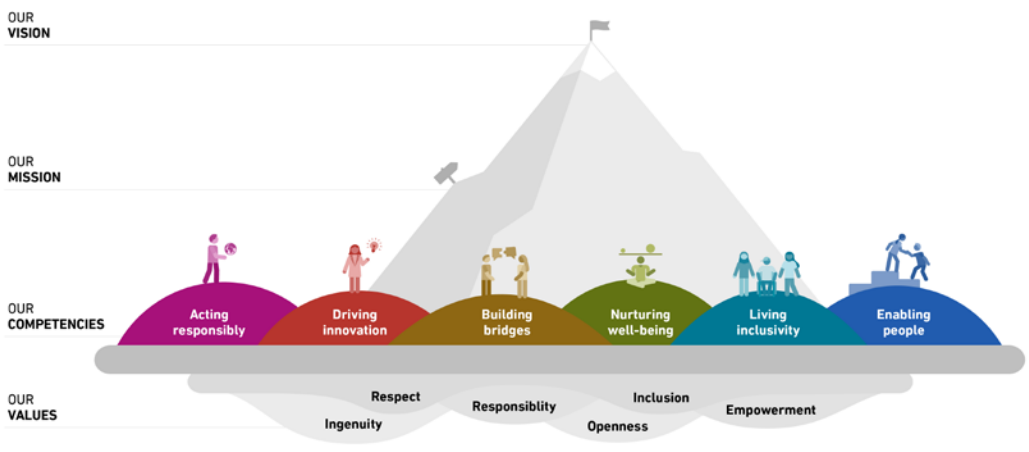
Increasing the proportion of women, especially in management positions, was a key concern of all institutions of the ETH Domain. At **ETH Zurich**, decision-making bodies and commissions were staffed as diversely as possible. Both universities succeeded in increasing the proportion of women in terms of both the number of professors and the number of female managers. In addition to joint programmes, such as Fix The Leaky Pipeline, High Potential University Leaders Identity & Skills Training (H.I.T.), COFUND Postdoc and We Advance, Connecting Women's Careers in Industry and Academia (CONNECT) launched its fifth round with four new partner companies. CONNECT brings together women's careers in STEM disciplines more strongly in academia, private industry and administration in order to promote the exchange of ideas and experiences. **EPFL** conducted mentoring, coaching and training programmes, such as Réseau romand de mentoring and Ateliers REGARD, as well as networking events in order to promote equal opportunity with regard to career opportunities in both academia and industry. It participated in the FemSpin project, which promotes equal opportunity for women in spin-off and start-up activities. **PSI** expanded feMLEAD (female Mentoring: Leadership for Equity And Diversity), its mentoring programme for women with leadership ambitions, to include employees at **WSL** and **Empa**. In an effort to highlight career opportunities, **Empa** held leadership seminars for women in future leadership roles. **Eawag** has a gender-appropriate recruitment policy, which also extends to higher manager positions.

Training and promotion of young scientists

All institutions of the ETH Domain develop a broad spectrum of measures and make offers available to prepare students and young researchers for a career in industry, administration, research or teaching. **ETH Zurich** implemented a peer learning programme that deals with such topics as career management and the leadership role of postdoctoral researchers. In addition, the ETH Career Center developed a career literacy programme and held Career Weeks for postdoctoral researchers. The concept consists of a combination of e-learning courses and online peer learning sessions. **EPFL's** Research Office and Technology Transfer Office conducted training courses and implemented supporting measures that promote careers in research, innovation and entrepreneurship and address issues of financing, management, intellectual property and professional ethics. In cooperation with WSL, **Empa** and Eawag, PSI founded the think tank Getting More Girls Excited About STEM. The group comprises people with various different roles in the ETH Domain. In connection with the Lead Campus, **WSL** was active in developing a common portfolio of expanded courses for young scientists. **Empa** offered specific courses for postdoctoral researchers and doctoral students. **Eawag** held staff meetings on the topics of career planning and opportunities for further development. All institutions took part in National Future Day and conducted activities (e.g. summer camps) to support young talent.

Integration of people with limitations

Guaranteeing accessibility is key to integrating people with specific needs within the ETH Domain. **ETH Zurich** conducted awareness-raising workshops, such as Barrier-free ETH. With the Design for All campaign, it implemented structural and technological projects, taking into account the needs of people with special requirements. Staff were able to "experience" **ETH Zurich** in a wheelchair or using a cane and simulation glasses. The "EPFL Without Barriers" project aimed at assessing and improving existing social and ecological



Skills that unite: social and leadership skills have been devised for all employees of ETH Zurich. These are combinations of expertise, knowledge and attitudes that align with ETH Zurich's strategy.
› ETH Zurich

barriers. Because of its efforts, the university was awarded the label Partner Company 2023 by the Canton of Vaud (invalidity insurance (IV) offices). All institutions conducted job trials for professional reintegration, as well as reintegration programmes for employees after extended absences. **PSI** worked with the external networks MyAbility and EnableMe. **WSL**, **Empa** and **Eawag** also created sustainable solutions for people with limitations in collaboration with the DI offices.

Training apprentices

All apprenticeships in the ETH Domain were able to be filled, and additional apprenticeships are being created at both universities. **ETH Zurich** developed a new vocational training strategy with the guiding principle "We empower young people for tomorrow's working world". A wide range of programmes are available to apprentices: a pre-apprenticeship pilot programme to support integration (INVOL) – now also in the IT career field, a two-year apprenticeship with EBA certification, a three- or four-year apprenticeship with EFZ certification, an abbreviated two-year apprenticeship, and the Way Up programme, which is an abbreviated apprenticeship for high school graduates. In this regard, the emphasis is on project-based, interdisciplinary cooperation. **EPFL** focused on redesigning the procedures for participating in job fairs and for presentations at schools. **PSI** apprentices were again awarded three medals at SwissSkills and qualifications at FaBest. **Empa** was again nominated by Great Place to Work as one of Switzerland's best host companies for apprentices. The vocational training departments at **WSL** and **Eawag** also conducted various marketing measures and informational events for the purpose of recruiting young talent.

External evaluation (Sub-objective 9.10)

Avenir Consulting audited the implementation of personnel sub-objectives 9.1 to 9.6 (personnel management and development at the institutions) for the years 2021–2023 and prepared an interim report with measures for further implementation of the targets in the ERI period 2021–2024. On the whole, the ETH Domain was issued a good report. Strengthening of strategic HR work is to be pursued further at a higher level. HR service quality should be maintained and further expanded. Basic qualifications and training courses should be mandatory so that the required knowledge regarding leadership work at the institutions is available across the board. In addition to prioritised digitalisation of HR in terms of individual offerings, the institutions are already benefiting from more intensive collaboration through various reforms and planned measures within the ETH Domain. This will be pursued further and expanded.

Outlook for 2024

At **ETH Zurich**, expansion of the Lifelong Learning Hub is resulting in the embedding of a common learning culture, the strengthening of leadership skills and the networking of people. At **EPFL**, the Nexus HR 4.0 project will start (transformation of the financial and HR information systems and the associated management processes) and an action plan will be implemented to promote the protection of privacy and to prevent and deal with harassment situations and psychosocial risks. In future, the four research institutes will take up employer branding, digitalisation of HR processes, promotion of diversity and a culture of respect, topics of occupational healthcare management and the implementation of the Lead Campus. Moreover, in light of economic development and the shortage of skilled workers, personnel marketing is becoming increasingly important.

Key Figures Personnel 2023

On 31 December 2023, the headcount in the ETH Domain stood at 24,890 employment contracts (ECs) or 21,008.0 full-time equivalents (FTEs) (see Fig. 17, p. 102). The headcount increased by 515 ECs (+2.1% or 329.8 FTEs compared to the previous year. The increase in headcount was much smaller compared to previous years (growth rates between 2% and 4%). This was mainly due to the fluctuating use of research assistants with a low employment level at ETH Zurich.

The scientific personnel, which also includes doctoral students, remains by far the largest role in the ETH Domain with 14,932 ECs (12,346.9 FTEs) (60.0% of the total headcount, see Fig. 17, p. 102), followed by the technical staff, which accounts for 4,312 ECs (3,896.9 FTEs) or 17.3% of the headcount. Of all employees, 17.1% or 4,262 ECs (3,411.3 FTEs) are administrative employees and 1.9% are apprentices. 2023 saw the new appointment of 50 professorships, with the total number of professors now at 906 ECs (875.9 FTE). They made up 3.7% of the total headcount.

Professors
In 2023, ETH Zurich and EPFL had a total of 715 full and associate professors: in addition, they had 140 assistant professors with tenure track (TT) and 51 assistant professors without TT (see Fig. 18, p. 102).

The proportion of women in these three categories grew from 21.9% to 23.7% in 2023. The figures were 19.0% for full and associate professors, 44.3% for assistant professors with TT and 33.3% for assistant professors without TT.

In 2023, 67.9% of the total of 906 professors came from abroad (2022: 67.2%). Of these, 47.1% (2022: 46.9%) came from the EU, and 20.8% from other countries (2022: 20.3%) (see Fig. 19, p. 103).

Financing the professorships
Of the 540 professors (521.1 FTEs) employed at ETH Zurich as of 31 December 2023, 459.4 FTEs (88.1%) were financed by the total federal contribution, 17.0 FTEs (3.3%) by SNSF, 0.7 FTEs (0.1%) by government-funded research, 12.8 FTEs (2.5%) by EU research programmes, and 31.2 FTEs (6.0%) by third-party financial research contributions, as well as by donations and bequests.

Of the 366 professorships (354.9 FTEs) at EPFL as of 31 December 2023, 327.1 FTEs (92.2%) were financed by the total federal contribution, 4.0 FTEs (1.1%) by the SNSF, 1.0 FTE (0.3%) by government-funded research, 0.1 FTE by the EU research programmes, and 22.7 FTEs (6.4%) by third-party financial research contributions, as well as by donations and bequests.

Proportion of women
The proportion of women in the ETH Domain increased in 2023 to 36.7% (2022: 36.4%), although it varies significantly by institution, role and discipline (see Fig. 22, p. 104).

The proportion of women in managerial positions (from function level 10) rose to 24.8% (2022: 23.9%). The two universities, WSL and Eawag made a significant contribution to this increase.

Apprentices
In the reporting period, the ETH Domain offered 478 apprentices an apprenticeship in more than 20 different career paths. Women accounted for 31.8% of apprentices in 2023.

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Monitoring table on the strategic objectives by the Federal Council

Fig. 3: Monitoring table on the strategic objectives set by the Federal Council for the ETH Domain for 2021–2024

	Reference values			Monitoring		
Indicators	2013	2017	2020	2021	2022	2023
TEACHING						
Students and doctoral students ETH Zurich and EPFL (headcount)						
New admissions						
At Bachelor's level	5,255	4,756	5,245	5,218	5,295	5,660
Students[1]	**22,099**	**25,059**	**28,637**	**29,243**	**30,141**	**31,600**
Proportion of women (%)	29.1	30.6	31.7	31.9	32.0	32.3
Proportion of foreign nationals (%)	35.5	38.4	40.7	40.9	42.8	44.3
At Bachelor's level[1]	13,995	14,385	15,983	16,650	16,995	17,888
Proportion of women (%)	28.6	30.6	32.0	32.5	32.4	33.0
Proportion of foreign nationals (%)	30.9	29.4	32.6	34.1	36.2	38.3
At Master's level[1]	7,241	8,895	11,143	11,741	12,329	12,870
Proportion of women (%)	29.4	29.4	30.3	30.4	30.9	30.9
Proportion of foreign nationals (%)	43.1	45.4	48.4	50.0	51.6	52.4
On MAS/MBA programmes	863	840	816	852	817	842
Proportion of women (%)	34.6	38.8	42.6	42.1	41.7	38.4
Proportion of foreign nationals (%)	45.7	51.5	47.7	48.5	47.9	49.2
Visiting students (incoming)[1]	–	939	695	–	–	–
Proportion of women (%)	–	35.5	33.7	–	–	–
Proportion of foreign nationals (%)	–	96.5	95.0	–	–	–
Supervision ratio						
Bachelor's and Master's students per professor	27.7	28.3	31.7	33.2	33.6	35.1
Doctoral students	**5,947**	**6,234**	**6,598**	**6,867**	**6,975**	**6,837**
Proportion of women (%)	30.4	30.8	33.6	33.9	34.0	34.6
Proportion of foreign nationals (%)	72.6	75.0	78.1	78.6	78.6	79.1
Supervision ratio						
Doctoral students per professor	7.7	7.6	7.7	8.0	8.0	7.8
Students and doctoral students[1]	**28,046**	**31,293**	**35,235**	**36,110**	**37,116**	**38,437**
Proportion of women (%)	29.4	30.6	32.0	32.3	32.4	32.7
Proportion of foreign nationals (%)	43.3	45.7	47.7	48.1	49.5	50.5
Supervision ratio						
Students and doctoral students per professor	36.5	38.0	41.2	42.3	42.6	43.9
Degrees						
Bachelor	2,249	2,602	3,007	3,213	3,148	3,356
Diploma, Master	2,663	3,065	3,344	3,898	3,760	3,998
MAS/MBA	346	394	249	304	318	309
Doctorate	993	1,258	1,171	1,257	1,458	1,403
Teaching and supervision by the research institutes						
Teaching hours	15,670	17,992	18,553	19,305	21,348	25,617
Bachelor's, Master's and Diploma projects	532	602	608	736	727	716
Doctoral students	797	807	842	872	924	950
Proportion of women (%)	36.3	39.0	39.9	39.0	38.4	40.8
Proportion enrolled in the ETH Domain (%)	67.9	67.7	70.3	70.8	69.4	68.9
Proportion enrolled at a foreign university (%)	13.4	10.3	9.1	11.0	12.1	11.7

RESEARCH						
Publications[2]	–	–	–	–	–	–
Research contributions, mandates and scientific services (in CHF millions)	–	**743.2**	**774.1**	**787.7**	**795.4**	**822.3**
of which Swiss National Science Foundation (SNSF)	209.0	260.3	262.6	267.8	268.3	287.0
of which Innosuisse	36.8	62.6	50.6	41.3	44.3	47.7
of which EU Framework programmes for Research and Innovation (EU-FP)	135.2	139.2	146.4	160.2	154.4	149.3
KNOWLEDGE AND TECHNOLOGY TRANSFER (KTT)						
Invention disclosures[3]	–	343	310	330	310	314
Software notifications[3, 4]	–	26	32	39	37	26
Patents	193	206	217	213	227	187
Licences[5]	223	377	338	181	180	156
Spin-offs	43	48	66	60	54	69
STAFF (FTE)						
Professors	767.7	823.8	854.6	854.6	872.0	875.9
Proportion of women (%)	12.4	14.8	18.6	20.0	21.8	23.8
Proportion of foreign nationals (%)	67.1	67.2	67.3	67.7	67.7	68.3
Scientific staff	9,927.3	11,204.4	11,994.6	12,277.4	12,245.5	12,346.9
Technical staff	3,157.3	3,439.8	3,676.3	3,722.3	3,772.4	3,896.9
Administrative staff	2,279.0	2,690.0	3,118.9	3,214.9	3,326.2	3,411.3
Apprentices	435.0	473.6	472.6	464.6	462.1	477.0
FINANCES/REAL ESTATE						
Total federal contribution (expenditure ceiling perspective) (in CHF million)	**2,271.4**	**2,530.8**	**2,596.1**	**2,600.1**	**2,666.2**	**2,736.2**
of which federal financial contribution	2,073.9	2,377.9	2,355.1	2,373.3	2,441.4	2,535.0
of which investment credit for construction in the ETH Domain	197.5	152.9	241.0	226.8	224.8	201.2

[1] Until 2016, visiting students (incoming) were counted yearly in the numbers of students at Bachelor's and Master's levels. In 2017-2020, visiting students were reported yearly as a separate student category and counted in the total number of students. Since 2021, visiting students have been reported per semester in a separate table (see Fig. 11) and are no longer counted in the total number of students. Without this modification, ETH Zurich and EPFL would have counted a total of 30,294 in 2021.

[2] Publishing activity is assessed every four years as part of the intermediate evaluation.

[3] Additional KTT indicators introduced in 2017.

[4] Open source software not included.

[5] The definition of licences was revised in 2021. This category no longer includes contracts with prior IP transfer and contracts for software licences of less than CHF 1,000. This should be taken into account when comparing with figures from previous years. Without this change, the total number of licences would have been 406 in 2021.

Indicators and counting methods for the monitoring table and the academic achievement report

If not specified in more detail, the term "students" is always understood to mean students at Bachelor's and Master's levels, as well as students in Master of Advanced Studies and Master of Business Administration (MAS/MBA) continuing education programmes. Doctoral students are defined as a separate category. Students and doctoral students are counted in numbers of persons (headcount). These figures may differ from those which ETH Zurich and EPFL enter in their respective annual reports, as there are different counting methods.

As of 2021, visiting students are no longer included in the total number of students. Incoming visiting students (students who are enrolled at another university and study for at least three months or 20 ECTS at one of the two Federal Institutes of Technology) and outgoing visiting students (students who are enrolled at one of the two Federal Institutes of Technology and study for at least three months or 20 ECTS at another university) are now listed in a separate table for each semester. Foreign students and doctoral students form two sub-categories: foreign-educated foreign nationals who resided abroad while obtaining the relevant necessary qualifications, and Swiss-educated foreign nationals who resided in Switzerland while obtaining the relevant necessary qualifications.

The employment level of all staff is counted in terms of full-time equivalents (FTE). Professors, both full and associate, as well as assistant professors, including recipients of the Swiss National Science Foundation (SNSF) Eccellenza professorial fellowship who are employed at one of the two Federal Institutes of Technology, are taken into account in the calculation of the supervision ratio. Senior scientists and Maîtres d'enseignement et de recherche (MER) from both Federal Institutes of Technology correspond to the academic staff in management roles or senior management staff. Some of them are adjunct professors. To determine the "expanded" supervision ratio, the Senior Scientists and MER of both Federal Institutes of Technology are added to the professors. The teaching hours delivered by the research institutes do not include preparation time, only the time spent in the presence of students.

Academic achievement report

Fig. 4: Students and doctoral students by discipline

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Δ 2022/2023	
												in %
Architecture	**3,066**	**3,060**	**3,030**	**3,047**	**3,041**	**3,090**	**3,035**	**3,169**	**3,254**	**3,404**	**150**	**4.6**
ETH Zurich	1,783	1,805	1,771	1,823	1,855	1,904	1,923	2,031	2,136	2,204	68	3.2
EPFL	1,283	1,255	1,259	1,224	1,186	1,186	1,112	1,138	1,118	1,200	82	7.3
Civil and Geomatic Engineering	**2,946**	**2,882**	**2,860**	**2,791**	**2,777**	**2,716**	**2,700**	**2,641**	**2,576**	**2,517**	**−59**	**−2.3**
ETH Zurich	1,731	1,716	1,701	1,688	1,667	1,614	1,646	1,606	1,537	1,486	−51	−3.3
EPFL	1,215	1,166	1,159	1,103	1,110	1,102	1,054	1,035	1,039	1,031	−8	−0.8
Engineering Sciences	**7,502**	**7,903**	**8,069**	**8,398**	**8,699**	**9,081**	**9,577**	**9,795**	**10,045**	**10,380**	**335**	**3.3**
ETH Zurich	4,729	4,930	4,993	5,135	5,224	5,467	5,851	6,053	6,202	6,217	15	0.2
EPFL	2,773	2,973	3,076	3,263	3,475	3,614	3,726	3,742	3,843	4,163	320	8.3
Information and Communications Technology	**2,665**	**2,809**	**3,033**	**3,261**	**3,648**	**4,031**	**4,529**	**4,929**	**5,417**	**5,857**	**440**	**8.1**
ETH Zurich	1,247	1,405	1,536	1,753	1,991	2,246	2,560	2,776	3,021	3,281	260	8.6
EPFL	1,418	1,404	1,497	1,508	1,657	1,785	1,969	2,153	2,396	2,576	180	7.5
Exact and Natural Sciences	**4,944**	**5,145**	**5,442**	**5,595**	**5,810**	**5,940**	**6,290**	**6,412**	**6,689**	**7,040**	**351**	**5.2**
ETH Zurich	3,024	3,157	3,352	3,505	3,691	3,794	4,039	4,063	4,238	4,417	179	4.2
EPFL	1,920	1,988	2,090	2,090	2,119	2,146	2,251	2,349	2,451	2,623	172	7.0
Human Medicine[1]	**–**	**–**	**–**	**99**	**192**	**286**	**296**	**311**	**302**	**314**	**12**	**4.0**
ETH Zurich	–	–	–	99	192	286	296	311	302	314	12	4.0
Life Sciences	**3,990**	**4,051**	**4,216**	**4,312**	**4,500**	**4,624**	**4,859**	**4,864**	**4,942**	**5,030**	**88**	**1.8**
ETH Zurich	3,012	3,044	3,162	3,218	3,326	3,433	3,566	3,595	3,658	3,667	9	0.2
EPFL	978	1,007	1,054	1,094	1,174	1,191	1,293	1,269	1,284	1,363	79	6.2
System-oriented Natural Sciences	**2,211**	**2,284**	**2,411**	**2,437**	**2,520**	**2,538**	**2,569**	**2,542**	**2,447**	**2,411**	**−36**	**−1.5**
ETH Zurich	2,211	2,284	2,411	2,437	2,520	2,538	2,569	2,542	2,447	2,411	−36	−1.5
Management, Technology, Economics	**913**	**913**	**972**	**973**	**966**	**954**	**937**	**962**	**965**	**979**	**14**	**1.5**
ETH Zurich	579	582	571	583	573	560	566	571	574	553	−21	−3.7
EPFL	334	331	401	390	393	394	371	391	391	426	35	9.0
Humanities, Social and Political Sciences[2]	**300**	**310**	**318**	**380**	**378**	**382**	**443**	**485**	**479**	**505**	**26**	**5.4**
ETH Zurich	300	310	318	366	358	351	406	435	425	442	17	4.0
EPFL	–	–	–	14	20	31	37	50	54	63	9	16.7
Total students and doctoral students	**28,537**	**29,357**	**30,351**	**31,293**	**32,531**	**33,642**	**35,235**	**36,110**	**37,116**	**38,437**	**1,321**	**3.6**
ETH Zurich	18,616	19,233	19,815	20,607	21,397	22,193	23,422	23,983	24,540	24,992	452	1.8
EPFL	9,921	10,124	10,536	10,686	11,134	11,449	11,813	12,127	12,576	13,445	869	6.9
Women	**8,414**	**8,677**	**9,091**	**9,587**	**10,167**	**10,675**	**11,280**	**11,660**	**12,027**	**12,572**	**545**	**4.5**
ETH Zurich	5,701	5,873	6,164	6,563	6,917	7,304	7,768	7,995	8,194	8,353	159	1.9
EPFL	2,713	2,804	2,927	3,024	3,250	3,371	3,512	3,665	3,833	4,219	386	10.1
Foreign nationals	**12,354**	**12,804**	**13,615**	**14,290**	**15,160**	**15,993**	**16,799**	**17,368**	**18,387**	**19,404**	**1,017**	**5.5**
ETH Zurich	6,949	7,226	7,563	7,972	8,433	8,876	9,438	9,808	10,371	10,731	360	3.5
EPFL	5,405	5,578	6,052	6,318	6,727	7,117	7,361	7,560	8,016	8,673	657	8.2

Since 2021, visiting students are no longer counted in the student totals. This should be taken into account when comparing with figures from previous years.

[1] ETH Zurich introduced a Bachelor's degree in Human Medicine in 2017.

[2] EPFL introduced a Master's degree in Digital Humanities in 2017.

Fig. 5: Students and doctoral students by academic level

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Δ 2022/2023	
												in %
Bachelor's programmes	**13,944**	**14,292**	**14,727**	**14,385**	**14,792**	**15,243**	**15,983**	**16,650**	**16,995**	**17,888**	**893**	**5.3**
ETH Zurich	8,820	9,087	9,309	9,262	9,517	9,895	10,355	10,642	10,665	10,948	283	2.7
EPFL	5,124	5,205	5,418	5,123	5,275	5,348	5,628	6,008	6,330	6,940	610	9.6
Master's programmes	**7,781**	**8,126**	**8,662**	**8,895**	**9,517**	**10,163**	**11,143**	**11,741**	**12,329**	**12,870**	**541**	**4.4**
ETH Zurich	5,187	5,480	5,861	6,158	6,590	7,037	7,790	8,206	8,641	8,916	275	3.2
EPFL	2,594	2,646	2,801	2,737	2,927	3,126	3,353	3,535	3,688	3,954	266	7.2
MAS/MBA	**805**	**836**	**828**	**840**	**827**	**809**	**816**	**852**	**817**	**842**	**25**	**3.1**
ETH Zurich	634	640	635	646	635	626	644	675	673	703	30	4.5
EPFL	171	196	193	194	192	183	172	177	144	139	−5	−3.5
Visiting students (incoming)[1]	**–**	**–**	**–**	**939**	**1,004**	**1,060**	**695**	**–**	**–**	**–**	**–**	**–**
ETH Zurich	–	–	–	449	480	467	317	–	–	–	–	–
EPFL	–	–	–	490	524	593	378	–	–	–	–	–
Total number of students[1]	**22,530**	**23,254**	**24,217**	**25,059**	**26,140**	**27,275**	**28,637**	**29,243**	**30,141**	**31,600**	**1,459**	**4.8**
ETH Zurich	14,641	15,207	15,805	16,515	17,222	18,025	19,106	19,523	19,979	20,567	588	2.9
EPFL	7,889	8,047	8,412	8,544	8,918	9,250	9,531	9,720	10,162	11,033	871	8.6
Doctoral programmes	**6,007**	**6,103**	**6,134**	**6,234**	**6,391**	**6,367**	**6,598**	**6,867**	**6,975**	**6,837**	**−138**	**−2.0**
ETH Zurich	3,975	4,026	4,010	4,092	4,175	4,168	4,316	4,460	4,561	4,425	−136	−3.0
EPFL	2,032	2,077	2,124	2,142	2,216	2,199	2,282	2,407	2,414	2,412	−2	−0.1
Total students and doctoral students[1]	**28,537**	**29,357**	**30,351**	**31,293**	**32,531**	**33,642**	**35,235**	**36,110**	**37,116**	**38,437**	**1,321**	**3.6**
ETH Zurich	18,616	19,233	19,815	20,607	21,397	22,193	23,422	23,983	24,540	24,992	452	1.8
EPFL	9,921	10,124	10,536	10,686	11,134	11,449	11,813	12,127	12,576	13,445	869	6.9

[1] Until 2016, visiting students (incoming) were counted yearly in the numbers of students at Bachelor's and Master's levels. In 2018–2020, visiting students were reported yearly as a separate student category and counted in the total number of students. Since 2021, visiting students have been reported per semester in a separate table (see Fig. 11, p. 96) and are no longer counted in the total number of students. Without this modification, ETH Zurich and EPFL would have counted a total of 30,294 in 2021.

Fig. 6: New admissions to the Bachelor's level at ETH Zurich and EPFL

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Δ 2022/2023	
												in %
Architecture	564	573	569	437	450	468	498	550	546	576	30	5.5
Civil and Geomatic Engineering	486	493	488	366	370	383	403	384	336	316	−20	−6.0
Engineering Sciences	1,393	1,550	1,518	1,350	1,303	1,353	1,327	1,333	1,401	1,621	220	15.7
Information and Communications Technology	595	596	679	582	662	708	780	799	897	896	−1	−0.1
Exact and Natural Sciences	952	1,001	1,108	985	928	952	1,074	1,091	1,162	1,276	114	9.8
Human Medicine[1]	–	–	–	100	100	100	100	99	99	104	5	5.1
Life Sciences	721	695	778	635	696	725	719	659	620	624	4	0.6
System-oriented Natural Sciences	316	366	372	288	307	259	326	288	219	232	13	5.9
Management, Technology, Economics	–	–	–	–	–	–	–	–	–	–	–	–
Humanities, Social and Political Sciences	14	16	19	13	11	18	18	15	15	15	0	0.0
Total	**5,041**	**5,290**	**5,531**	**4,756**	**4,827**	**4,966**	**5,245**	**5,218**	**5,295**	**5,660**	**365**	**6.9**

[1] ETH Zurich introduced a Bachelor's degree in Human Medicine in 2017. New admissions in this discipline are limited to 100 and will therefore remain stable over the years.

Fig. 7: Percentage of women among students and doctoral students at ETH Zurich and EPFL

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
% at the Bachelor's level	28.7	29.2	30.0	30.6	31.6	31.9	32.0	32.5	32.4	33.0
% at the Master's level	29.5	28.6	28.5	29.4	29.6	29.8	30.3	30.4	30.9	30.9
% at the Bachelor's and Master's level	29.0	28.9	29.4	30.1	30.8	31.1	31.3	31.6	31.8	32.1
% in MAS/MBA programmes	35.0	38.6	37.9	38.8	40.6	40.3	42.6	42.1	41.7	38.4
% at the doctoral level	30.6	30.6	31.0	30.8	31.4	32.8	33.6	33.9	34.0	34.6

Fig. 8: Supervision ratios at ETH Zurich and EPFL

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Supervision ratio										
at the Bachelor's/Master's level	28.0	28.6	29.2	28.3	29.7	30.6	31.7	33.2	33.6	35.1
at the Doctoral level	7.8	7.8	7.7	7.6	7.8	7.7	7.7	8.0	8.0	7.8
Extended supervision ratio										
at the Bachelor's/Master's level	18.8	19.3	19.8	19.2	20.0	20.7	21.5	22.5	22.8	23.9
at the Doctoral level	5.2	5.3	5.2	5.1	5.3	5.2	5.2	5.4	5.4	5.3

Fig. 9: Percentage of foreign nationals among students and doctoral students at ETH Zurich and EPFL

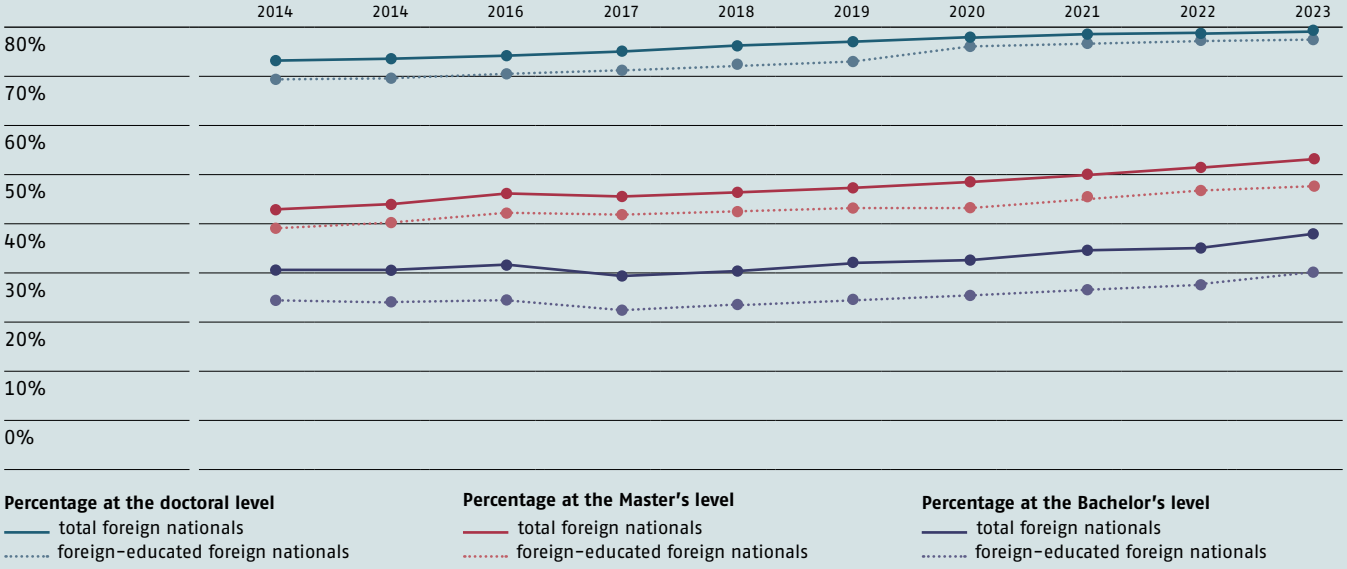


Fig. 10: Degrees awarded by academic level

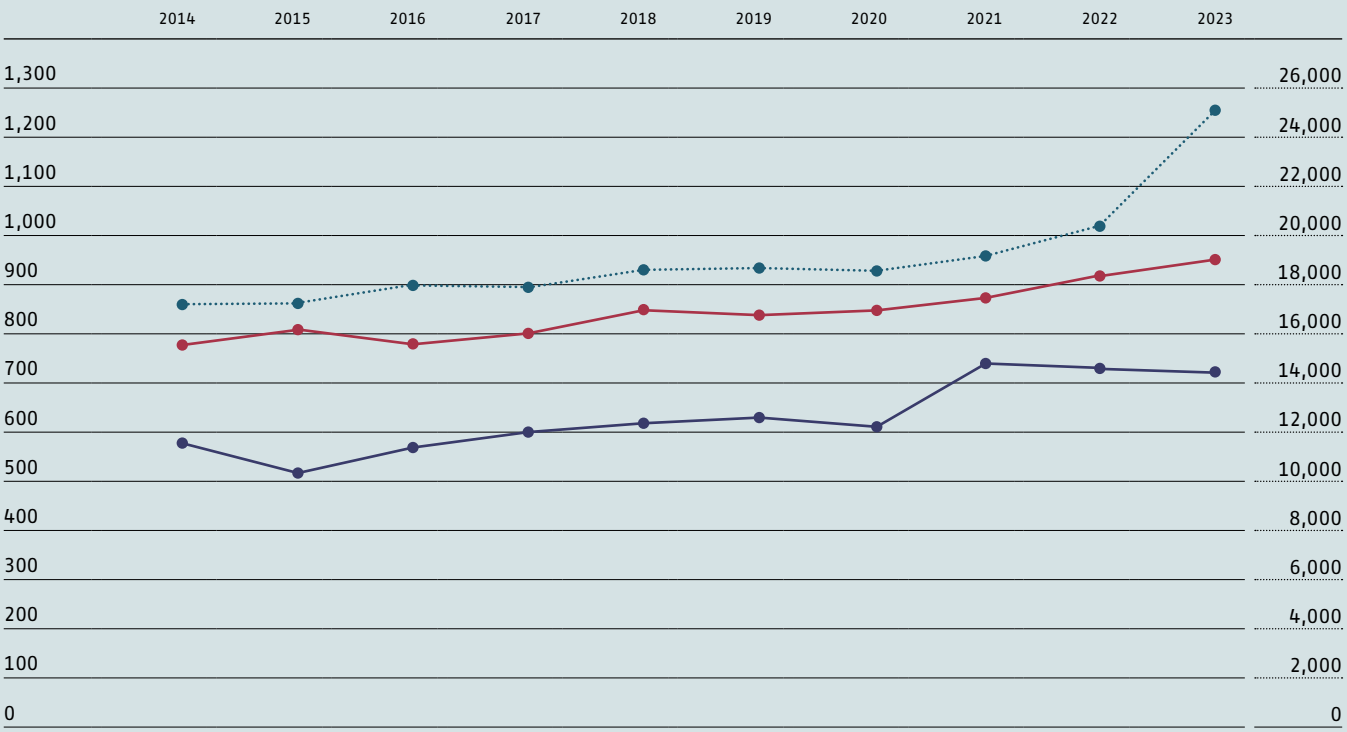
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Δ 2022/2023	
												in %
Bachelor	**2,538**	**2,528**	**2,500**	**2,602**	**2,686**	**2,876**	**3,007**	**3,213**	**3,148**	**3,356**	**208**	**6.6**
ETH Zurich	1,579	1,564	1,571	1,606	1,678	1,758	1,843	2,084	1,934	2,034	100	5.2
EPFL	959	964	929	996	1,008	1,118	1,164	1,129	1,214	1,322	108	8.9
Master	**2,711**	**2,821**	**2,989**	**3,065**	**3,240**	**3,368**	**3,344**	**3,898**	**3,760**	**3,998**	**238**	**6.3**
ETH Zurich	1,839	1,879	2,015	2,072	2,196	2,335	2,260	2,723	2,512	2,754	242	9.6
EPFL	872	942	974	993	1,044	1,033	1,084	1,175	1,248	1,244	– 4	– 0.3
MAS/MBA	**260**	**254**	**303**	**394**	**343**	**324**	**249**	**304**	**318**	**309**	**– 9**	**– 2.8**
ETH Zurich	205	175	203	272	232	245	160	219	236	236	0	0.0
EPFL	55	79	100	122	111	79	89	85	82	73	– 9	– 11.0
Doctorate	**1,197**	**1,109**	**1,256**	**1,258**	**1,209**	**1,290**	**1,171**	**1,257**	**1,458**	**1,403**	**– 55**	**– 3.8**
ETH Zurich	769	718	851	827	802	866	781	820	1,005	939	– 66	– 6.6
EPFL	428	391	405	431	407	424	390	437	453	464	11	2.4

Fig. 11: Visiting students

	2021		2022		2023	
	Spring Semester	Autumn Semester	Spring Semester	Autumn Semester	Spring Semester	Autumn Semester
Incoming						
at ETH Zurich	287	460	401	385	339	286
at EPFL	552	622	786	629	763	575
Outgoing						
from ETH Zurich	76	154	228	255	261	241
from EPFL	264	396	373	460	446	466

Since 2021, visiting students are no longer counted in the student totals and now figure only in the table above per semester. It should be noted that the figures given per semester cannot be added together to obtain an annual total without counting students present during the two semester twice.

Fig. 12: Teaching and supervision by the research institutes



Left axis: Number of Bachelor's, Master's and Diploma projects supervised
Right axis: Number of teaching hours per year

Number of doctoral projects supervised
Number of Bachelor's, Master's and Diploma projects supervised
Number of teaching hours per year

Knowledge and technology transfer

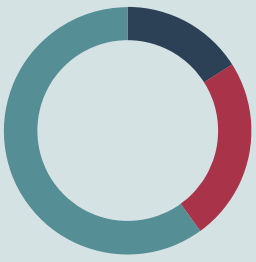
Fig. 13: Knowledge and technology transfer in the ETH Domain

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Invention disclosures[1]	**–**	**–**	**–**	**343**	**358**	**329**	**310**	**330**	**310**	**314**
ETH Zurich	–	–	–	171	205	159	165	169	142	172
EPFL	–	–	–	134	119	132	107	121	138	115
Research institutes	–	–	–	38	34	38	38	40	30	27
Software notifications[1,2]	**–**	**–**	**–**	**26**	**36**	**40**	**32**	**39**	**37**	**26**
ETH Zurich	–	–	–	20	19	26	18	24	28	11
EPFL	–	–	–	6	13	13	14	12	6	11
Research institutes	–	–	–	0	4	1	0	3	3	4
Patents	**211**	**219**	**230**	**206**	**230**	**224**	**217**	**213**	**227**	**187**
ETH Zurich	82	98	109	84	109	102	115	99	104	87
EPFL	99	88	100	95	95	98	75	88	95	86
Research institutes	30	33	21	27	26	24	27	26	28	14
Licences[3]	**270**	**311**	**353**	**377**	**341**	**324**	**338**	**181**	**180**	**156**
ETH Zurich	35	50	78	82	87	62	43	27	29	31
EPFL	46	48	58	50	39	50	53	40	43	45
Research institutes	189	213	217	245	215	212	242	114	108	80
Spin-offs	**49**	**48**	**50**	**48**	**55**	**59**	**66**	**60**	**54**	**69**
ETH Zurich	22	25	25	25	27	30	34	25	26	43
EPFL	24	18	20	15	25	23	25	32	21	21
Research institutes	3	5	5	8	3	6	7	3	7	5

[1] Invention disclosures and software notifications were introduced in 2017 as additional KTT indicators.
[2] Open source software not included.
[3] The definition of licences was revised in 2021. This category no longer includes contracts with prior IP transfer and contracts for software licences of less than CHF 1,000. This should be taken into account when comparing with figures from previous years. Without this change, the total number of licences would have been 406 in 2021.

Licences

156



ETH Zurich	31
EPFL	45
Research institutes	80

Invention disclosures

314

Software notifications

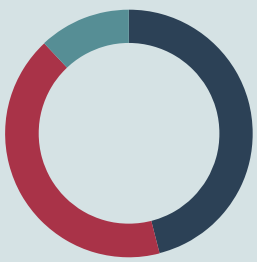
26

Spin-offs

69

Patents

187



ETH Zurich	82
EPFL	86
Research institutes	14

Fig. 14: Collaboration with the private and public sector

	2017	2018	2019	2020	2021	2022	2023
Collaboration contracts with the private sector	**507**	**594**	**570**	**610**	**585**	**566**	**496**
of which financed by the private sector	**316**	**415**	**404**	**388**	**396**	**390**	**327**
ETH Zurich	122	149	163	143	172	171	138
EPFL	99	120	125	95	94	120	95
Research institutions	95	146	116	150	130	99	94
of which financed by Innosuisse/EU-FP *	**191**	**179**	**166**	**222**	**189**	**176**	**169**
ETH Zurich	57	74	55	72	72	62	59
EPFL	66	49	61	56	45	41	44
Research institutions	68	56	50	94	72	73	66
Collaboration contracts with the Swiss public sector	**285**	**261**	**278**	**262**	**272**	**281**	**263**
ETH Zurich	88	100	88	92	94	87	77
EPFL	54	43	51	47	46	42	29
Research institutions	143	118	139	123	132	152	157

Number of new cooperation agreements (research agreements and scientific services) with the private and Swiss public sector involving a volume of at least CHF 50,000 per contract. These indicators were introduced in 2017.
* EU-FP: European Framework Programmes for Research and Innovation.

KTT indicators and counting method

Patents exclusively refer to first filings. The definition of licences was revised in 2021. This category now no longer includes contracts involving previous IP transfer or software licence contracts with a value of less than CHF 1,000. This must be taken into account when comparing these figures with those from previous years. The invention disclosures and software notifications correspond to the reports and notifications submitted in writing to the Technology Transfer Offices of the institutions of the ETH Domain in the reporting period. They reflect activities in the early phases of the innovation process, thereby supplementing the other KTT indicators. Open source software is not considered.

In order to reflect the cooperation between the institutions and the private and the public sectors, only recently concluded cooperation agreements are included. These are only research contracts and scientific services with a volume of at least CHF 50,000 per contract. Cooperation with the private sector is divided into two categories: projects that are directly financed by industry in Switzerland or abroad and those funded by Innosuisse or the EU Research Framework Programmes for Research and Innovation (EU-FP). Cooperation with the public sector includes contracts with public sector institutions in Switzerland but not those with national or international research funding organisations and foundations.

Globally respected rankings (see Fig. 15 and 16)

The universities are assessed and ranked by institutions and businesses using various methods. In the reporting year, the THE (Times Higher Education World University Rankings) and QS (QS World University Rankings) rankings significantly changed their methodology. This must be taken into account when making comparisons with previous years.

THE uses 17 key performance indicators for teaching (29.5% weighting), research environment (29%), research quality (30%), international outlook (7.5%) and financing by the industry (4%). **QS** focuses mainly on reputation (with a 30% weighting on academic reputation and 15% on employer reputation), followed by citations (20%), internationality (15%) and the student-teacher ratio (10%), while **ARWU** (Academic Ranking of World Universities of Shanghai Ranking Consultancy) makes use of performance indicators based on the academic performance or research output – in particular Nobel Prizes or Fields Medals – of graduates, staff and highly cited researchers from the institutions assessed. The publication activity of an institution is also judged based on the number of articles that have been published in a select group of the most respected journals, and the ratio between the number of publications and the number of researchers employed at an institution. The **CWTS Leiden** (Centre for Science and Technology Studies Leiden) ranking is based solely on the publication activity of the universities, using this to calculate the indicators to assess research performance. One commonly used indicator for ranking the universities in the CWTS Leiden ranking is the number and proportion of publications each university has among the top 10% of the most-cited publications in the relevant field (PP (top 10%)). The CWTS Leiden World and Europe rankings of both Federal Institutes of Technology (see Fig. 15) are based on this indicator.

University rankings

Fig. 15: Rankings of ETH Zurich (blue) and EPFL (red) according to the THE, QS, ARWU and CWTS Leiden rankings in 2023/2024

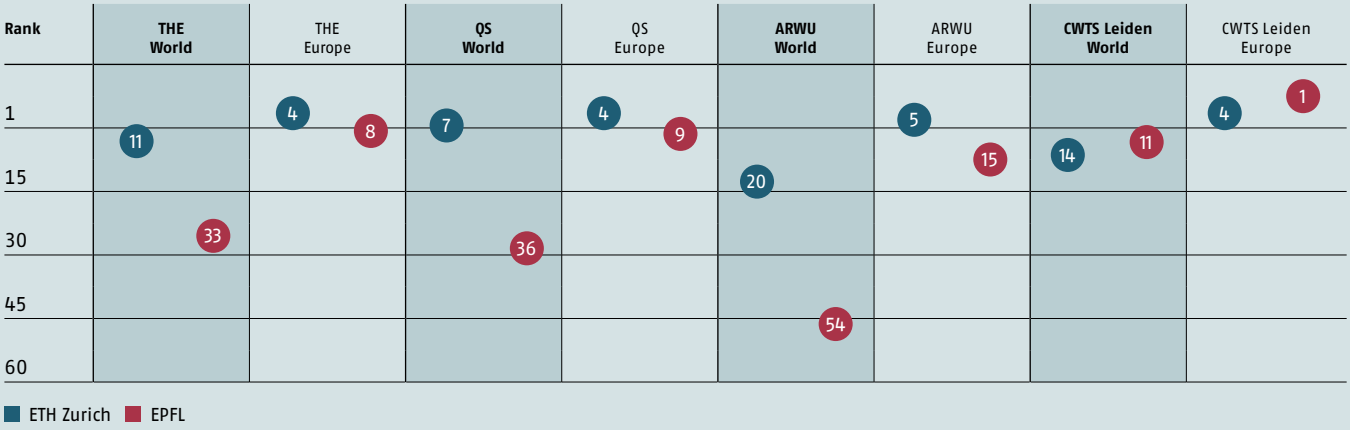
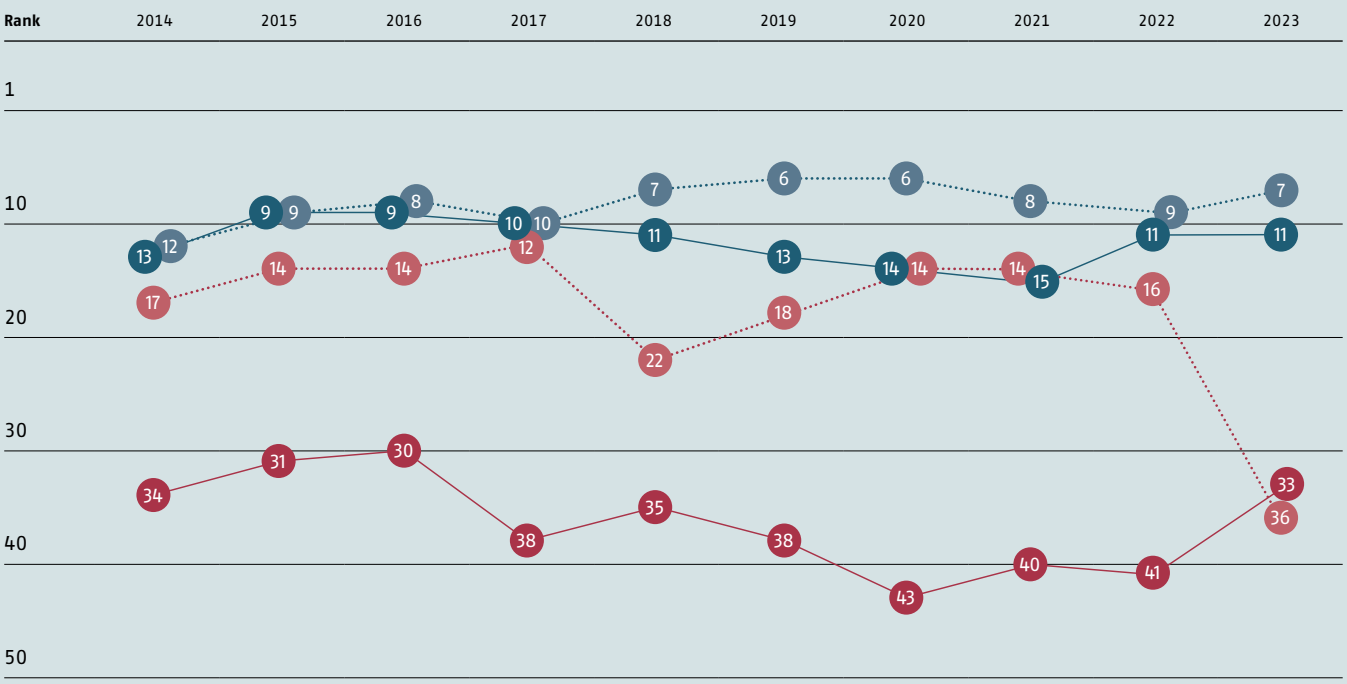


Fig. 16: Rankings of ETH Zurich (blue) and EPFL (red) according to the THE and QS World rankings 2014–2023



THE **Times Higher Education World University Rankings** from TES Global Limited, London
QS **QS World University Rankings** from Quacquarelli Symonds Limited, London
ARWU **Academic Ranking of World Universities** from ShanghaiRanking Consultancy
CWTS Leiden **CWTS Leiden Ranking** from the Centre for Science and Technology Studies (CWTS) of the University Leiden, Netherlands; indicator used: PP (top 10%) (see box on the left)

Personnel

Fig. 17: Headcount and employment level by function group

	Men			Women			ETH Domain		
2023	EC	FTE	ø EL %	EC	FTE	ø EL %	EC	FT	ø EL %
Professors (F/A)	579	556.7	96.1	136	130.3	95.8	715	687.0	96.1
Assistant professors with tenure track	78	78.0	100.0	62	62.0	100.0	140	140.0	100.0
Assistant professors without tenure track	34	33.1	97.4	17	15.8	92.9	51	48.9	95.9
Scientific personnel	9,951	8,337.8	83.8	4,981	4,009.1	80.5	14,932	12,346.9	82.7
of whom senior scientific personnel	678	651.8	96.1	131	120.7	92.1	809	772.5	95.5
Technical personnel	3,324	3,103.8	93.4	988	793.1	80.3	4,312	3,896.9	90.4
Administrative personnel	1,464	1,267.1	86.6	2,798	2,144.2	76.6	4,262	3,411.3	80.0
Apprentices	326	325.4	99.8	152	151.6	99.7	478	477.0	99.8
Total	**15,756**	**13,701.9**	**87.0**	**9,134**	**7,306.1**	**80.0**	**24,890**	**21,008.0**	**84.4**

Headcount (employment contracts, EC) and employment level (EL) of men, women and the entire ETH Domain by function group. Senior scientists, maîtres d'enseignement et de recherche (MER) and other senior personnel are counted separately, but nevertheless are still included under scientific personnel. A total of 6,837 doctoral students are enrolled at the two Federal Institutes of Technology. Of these, all who are employed in the ETH Domain are included under scientific personnel.

Fig. 18: Development in the numbers of female and male professors

	2023			2022			Changes		
	Men	Women	Total	Men	Women	Total	Men in %	Women in %	Total in %
Professors (F/A)	579	136	715	591	124	715	– 2.0	9.7	0.0
Assistant professors with tenure track	78	62	140	86	59	145	– 9.3	5.1	– 3.4
Assistant professors without tenure track	34	17	51	30	15	45	13.3	13.3	13.3
Total professors	**691**	**215**	**906**	**707**	**198**	**905**	**– 2.3**	**8.6**	**0.1**

Change in the number of professors according to: full and associate professors, assistant professors with tenure track and assistant professors without tenure track. The three last columns show the percentage change since the previous year.

Professorial categories

The various professorial categories differ with regard to status and employment conditions. Full (F) and associate (A) professors, and assistant professors with and without tenure track (TT) teach and undertake research at both Federal Institutes of Technology. Professors with TT can become permanently employed as full or associate professors if they meet a certain performance target. Full and associate professors are appointed permanently, while assistant professors sign employment contracts for four years. The latter can be renewed for a maximum of another four years; in the case of parenthood or for any other just cause, it is possible to renew the employment contacts for up to another year.

In the context of cooperating with other universities and research institutions, there is the option of a dual professorship and the appointment of affiliated professors with a low FTE level.

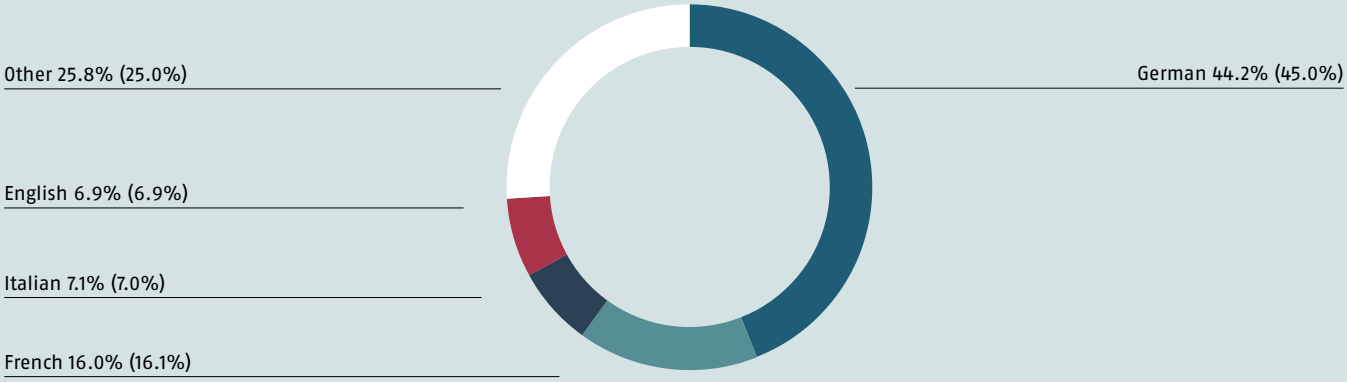
In recognition of outstanding performance in teaching and research, the title of adjunct professor may be conferred on senior scientific staff (senior scientists/*Maîtres d'enseignement et de recherche*, MER). Since 2022, the ETH Board has been able to award the title of Professor of Practice to external persons who have extensive professional experience and have excelled in their field. They take on teaching duties. The ordinance concerning professors does not apply to these persons.

Fig. 19: Country of origin of male and female professors

	Switzerland			EU			Other		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Professors (F/A)	218	46	264	267	67	334	94	23	117
Assistant professors with tenure track	8	7	15	43	26	69	27	29	56
Assistant professors without tenure track	8	4	12	14	10	24	12	3	15
Total professors	**234**	**57**	**291**	**324**	**103**	**427**	**133**	**55**	**188**

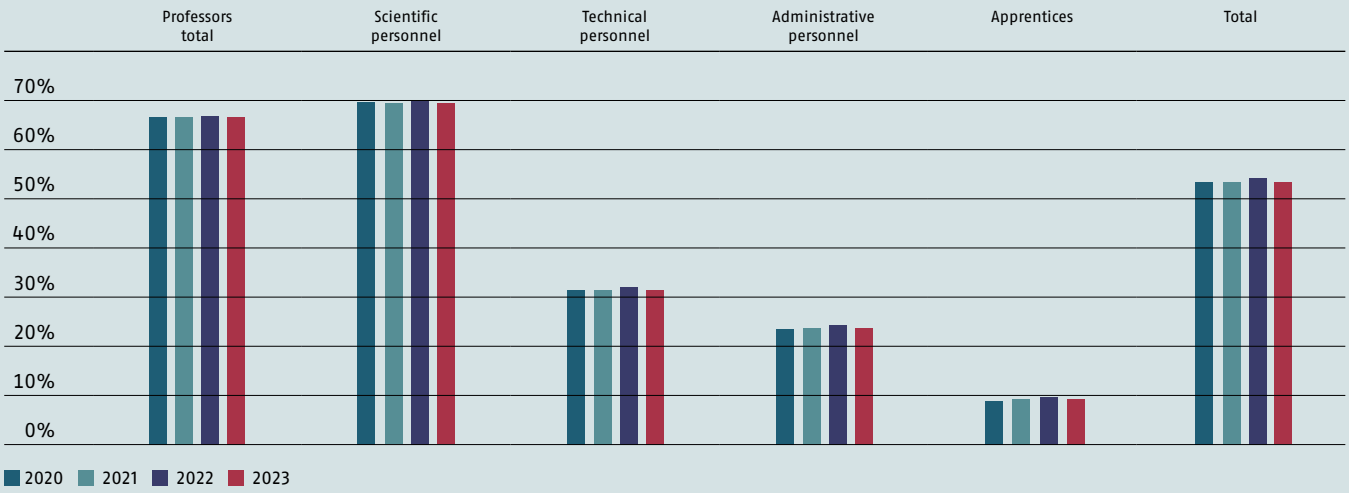
Number of professors broken down by country of origin: Switzerland, the EU and other countries.

Fig. 20: Employees' native languages 2023



Native languages of employees in the ETH Domain in 2023. Figures for the previous year are shown in brackets.

Fig. 21: Development in the proportions of foreign employees by function group



Development in the proportions of foreign employees in the ETH Domain by function group (in relation to the number of employment contracts, EC).

Fig. 22: Development in the proportion of women by institution

Development in the proportion of women by institution over the past four years (in relation to the number of employment contracts, EC).

Fig. 23: Development in the proportion of women in management positions in the ETH Domain

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	2643	2697	2,745	2,767	2,793	2,810	2,853	2,897	2,928	2,982	3,049	3,061	3,065
Women	413	445	464	492	507	521	561	576	610	644	693	733	760
Men	2230	2252	2,281	2,275	2,286	2,289	2,292	2,321	2,318	2,338	2,356	2,328	2,305
in % Women	**15.6**	**16.5**	**16.9**	**17.8**	**18.2**	**18.5**	**19.7**	**19.9**	**20.8**	**21.6**	**22.7**	**23.9**	**24.8**
in % Men	84.4	83.5	83.1	82.2	81.8	81.5	80.3	80.1	79.2	78.4	77.3	76.1	75.2

Development of the proportion of women in management positions in figures and percentages, i. e. function level 10 to 15 and professorship (with employment contracts, EC).

Abb. 24: Source of funds by function group

Function group		Professors (all)	Scientific personnel	Technical personnel	Administrative personnel	Total FTE
Source of funds						
Total federal contribution Federal financial contribution	2022	795.5	6,213.6	3,118.4	2,928.5	13,056.0
	2023	786.5	6,110.7	3,160.6	2,978.1	13,035.9
	Δ 2022 / 2023	– 9.0	– 102.9	42.2	49.6	– 20.1
Third-party resources Research funding (SNSF, Innosuisse, further), government-funded research and EU research programmes	2022	29.8	4,118.8	236.2	80.8	4,465.6
	2023	35.6	4,272.7	274.6	88.2	4,671.1
	Δ 2022 / 2023	5.8	153.9	38.4	7.4	205.5
Industry-oriented research, donations/bequests	2022	46.7	1,913.9	417.3	316.6	2,694.5
	2023	53.9	1,963.4	461.7	345.0	2,824.0
	Δ 2022 / 2023	7.2	49.5	44.4	28.4	129.5
Total	2022	872.0	12,246.3	3,771.9	3,325.9	20,216.1
	2023	876.0	12,346.8	3,896.9	3,411.3	20,531.0
	Δ 2022 / 2023	4.0	100.5	125.0	85.4	314.9

Source of funds according to function groups (in FTEs) in 2023 compared to 2022. Δ (delta) shows the absolute change compared to the previous year. Figures exclude apprentices (477,0 FTEs) and trainees.

Real estate

Fig. 25: Source of funds for ETH Domain construction (in CHF millions)

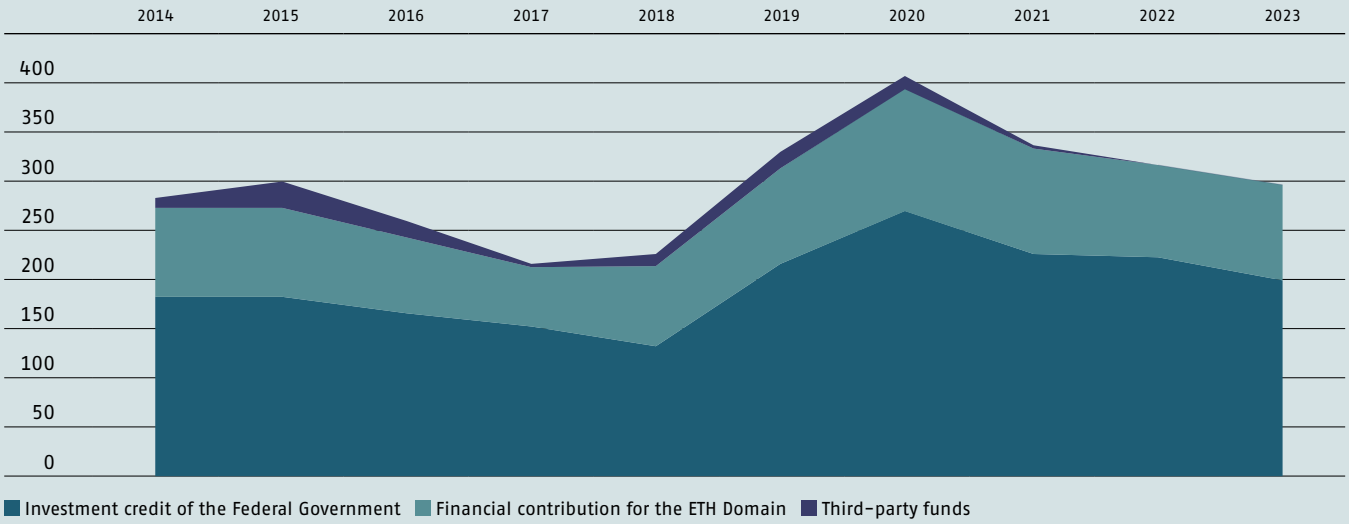
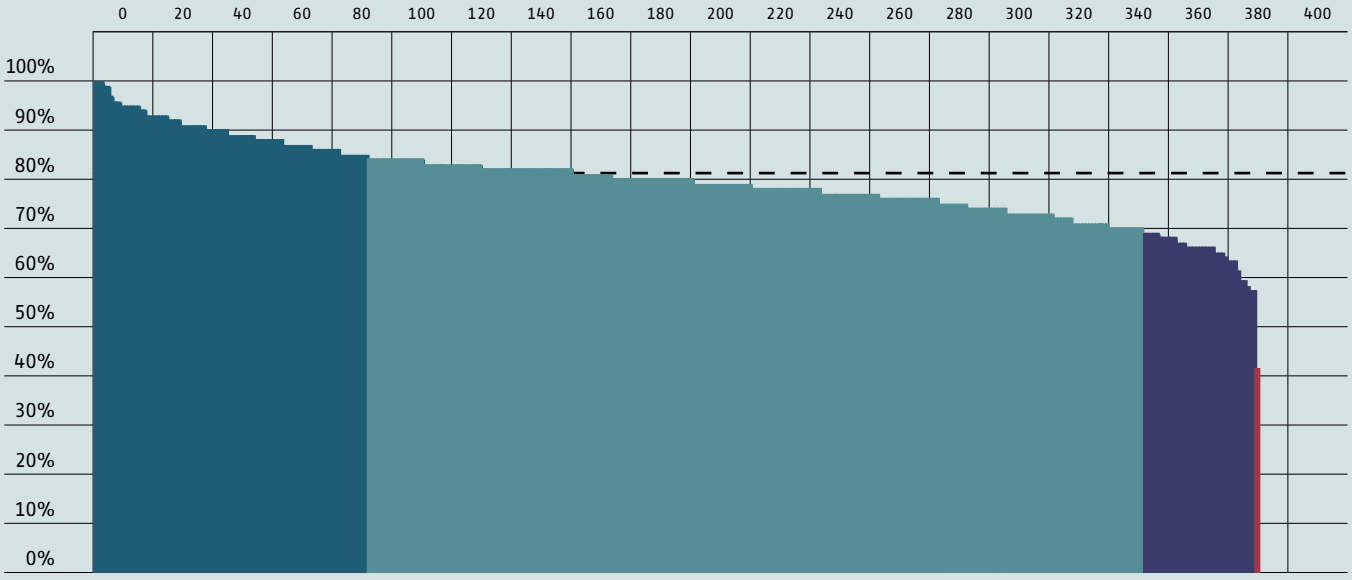


Fig. 26: Condition value as of 31 December 2023



Number of properties recorded: 375

Very good condition, as new
Good conditions, no measures needed
average weighted by original value of properties: 81.0%
Average condition, plan and implement measures
Poot conditions, measures needed

Fig. 27: Development of the main usable area by institution in %

Fig. 28: Mix of areas (in 1,000 m²)

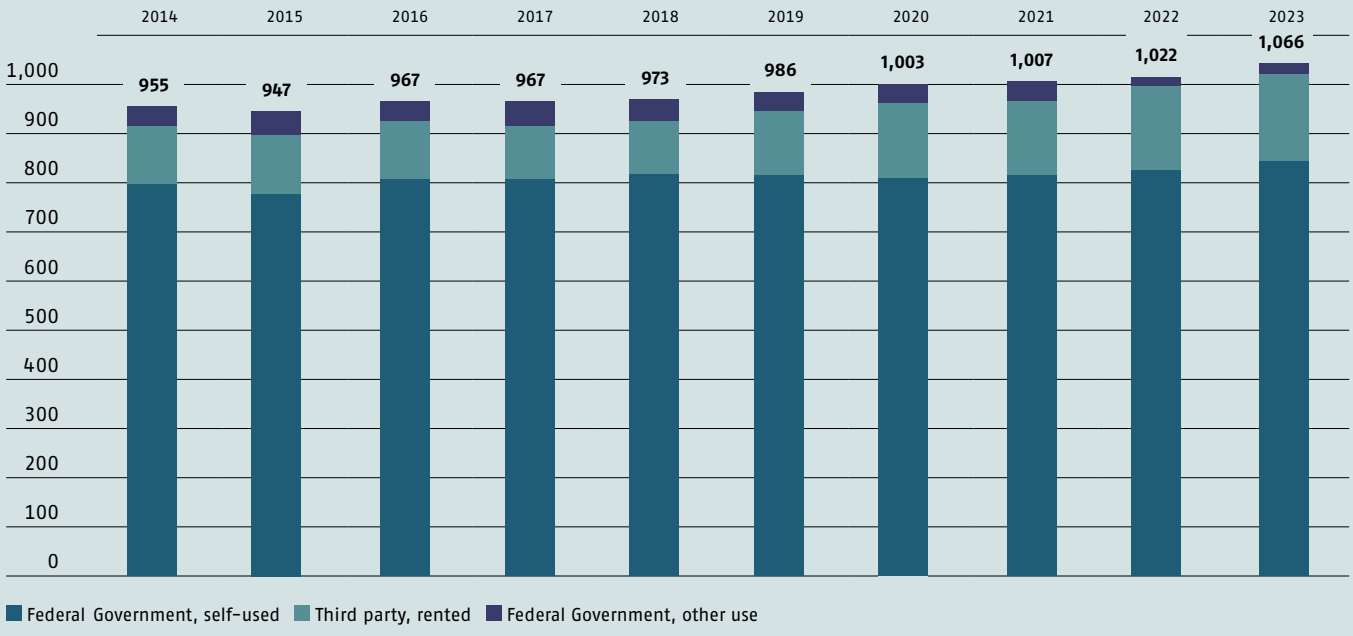


Fig. 29: Quantity structure of the ETH Domain portfolio

CHF millions	ETH Zurich	EPFL	PSI	WSL	Empa	Eawag	Total
Buildings							
Quantity	133	77	131	22	27	15	405
Original value	4,069	1,769	642	112	369	126	7,086
Book value	1,610	796	188	45	68	60	2,766
Plots							
Quantity	65	19	10	16	4	4	118
Book value	692	243	30	24	63	10	1,063
Book value of installations under construction	214	44	35	2	84	8	387
Building rights (not valuated, in compliance with regulations)							0
Total assets (book value real estate)	**2,516**	**1,084**	**252**	**71**	**215**	**78**	**4,216**
Provisions (e.g. for polluted sites, asbestos, radioactive waste)							256

Quantity and value of all government-owned real estate allocated to the institutions of the ETH Domain.

Fig. 30: Investments

CHF 1,000	ETH Zurich	EPFL	PSI	WSL	Empa	Eawag	Total
Investment credit from Federal Government	120,500	30,100	20,200	1,020	26,251	3,150	201,221
of which for new or replacement construction	40,270	7,418	16,644	537	24,895	20	89,783
of which for maintenance of value and functionality	80,230	22,682	3,556	483	1,356	3,130	111,438
Financial contribution investments (for user-specific construction)	61,515	16,431	7,213	617	8,678	2,386	96,839
Third-party resources	404	0	0	0	520	0	923
Construction expenses of the institutions	182,419	46,531	27,413	1,637	35,449	5,536	298,984
Main usable area (m²)	551,210	296,930	120,320	18,230	59,740	19,530	1,065,960
Construction expenses per m² main usable area (CHF/m²)	331	157	228	90	593	283	280

2023 investments in the ETH Domain portfolio, based on the main usable area (in m²). This is the part of the usable area that is directly allocated to the core task of teaching and research. Because the research institutes themselves do not provide teaching, a figure for the area across the entire Domain – for example in relation to the number of students – would not be very informative.

Environment and energy

Fig. 31: Environment and energy data

		ETH Domain 2021	ETH Domain 2022	ETH Zurich	EPFL	PSI	WSL	Empa	Eawag	ETH Domain Trend 2023[1]
BASIC DATA										
Energy reference area (ERA)[2]	m^2	1,482,996	1,531,435	733,427	440,731	172,571	27,032	123,442	34,232	1,562,414
Full-time equivalent[3]	FTE	41,738	42,679	24,395	13,304	2,132	939	1,184	725	43,808
ENERGY[4]										
Final energy, net[7]	**kWh/a**	**473,031,646**	**457,436,376**	**196,476,210**	**88,946,673**	**144,800,906**	**4,490,211**	**19,078,082**	**3,644,294**	**420,778,458**
Electricity, net (not incl. self-produced)	**kWh/a**	**371,014,550**	**366,793,941**	**136,974,733**	**72,385,000**	**139,575,028**	**3,274,934**	**11,279,395**	**3,304,851**	**353,767,251**
Consumption of uncertified electricity	kWh/a	0	59,073,646	0	55,149,000	3,924,646	0	0	0	
Consumption of certified electricity	kWh/a	369,540,975	305,475,091	136,007,000	17,000,000	135,296,354	3,145,164	10,908,732	3,117,841	
Electricity (without naturemade star)	kWh/a	346,346,751	280,764,344	132,007,000	0	135,000,000	803,220	12,954,124	0	
Photovoltaic naturemade star	kWh/a	2,343,548	2,374,300	0	2,000,000	296,354	0	0	77,946	
Hydro power naturemade star	kWh/a	22,762,028	24,381,839	4,000,000	15,000,000	0	2,341,944	0	3,039,895	
Wind naturemade star	kWh/a	273,877	0	0	0	0	0	0	0	
Sale of electricity	kWh/a	−2,185,229	−2,045,392	0	0	0	0	−2,045,392	0	
Heat	**kWh/a**	**101,842,296**	**91,037,637**	**59,746,000**	**16,584,000**	**5,390,430**	**851,966**	**7,938,788**	**526,453**	
Fuel oil	kWh/a	2,217,705	4,662,653	4,130,000	247,000	240,430	42,381	0	2,842	
Natural gas, biogas	kWh/a	69,303,289	57,774,308	37,190,000	15,471,000	0	0	4,906,288	207,020	
District heating	kWh/a	58,209,445	49,942,682	40,061,000	866,000	5,150,000	0	3,549,091	316,591	
Woodchip	kWh/a	910,183	809,585	0	0	0	809,585	0	0	
Sale of heat	kWh/a	−28,798,326	−22,151,591	−21,635,000	0	0	0	−516,591	0	
Fuel (own vehicles)	**kWh/a**	**1,648,375**	**1,850,002**	**723,210**	**213,673**	**189,476**	**493,081**	**230,562**	**0**	
Energy: additional information										
Energy costs, electricity and heat[5]	CHF/a	55,472,888	61,970,289	31,891,772	10,594,400	15,786,345	656,115	2,427,058	614,599	126,343,631
Self-generated renewable electricity	kWh/a	1,473,575	2,245,204	967,733	236,000	354,028	129,770	370,663	187,010	
Total sale to third parties	kWh/a	−30,298,229	−23,680,392	−21,635,000	0	0	0	−2,045,392	0	
WATER (DRINKING WATER)	m^3	422,675	563,946	272,934	194,000	63,865	8,962	18,022	6,163	657,268
MATERIALS										
Paper	**kg**	**134,785**	**200,167**	**92,000**	**76,101**	**18,106**	**4,418**	**6,933**	**2,609**	**183,161**
Paper, new fibre	kg	45,316	53,122	17,000	24,915	10,322	497	359	29	41,036
Paper, recycled	kg	89,469	147,045	75,000	51,186	7,784	3,921	6,574	2,580	142,125
KEY FIGURES: ENVIRONMENTAL IMPACT										
Primary energy[6]	**kWh/a**	**554,189,208**	**545,703,245**	**223,102,667**	**108,357,885**	**181,473,226**	**7,045,053**	**20,842,436**	**4,881,978**	
Proportion of renewable energies	**%**	**72**	**72**	**59**	**69**	**89**	**59**	**69**	**85**	
CO_2 emissions[8]	**t CO_2/a**	**29,704**	**27,385**	**18,275**	**6,535**	**595**	**360**	**1,426**	**194**	

1 Provisional figures for the year under review (trend), as of: start of March 2024.
2 The energy reference area is the sum of all gross floor areas, above and below ground, that must be heated or air-conditioned in order to be used.
3 The FTE (full-time equivalent) value listed here was supplemented by the number of students with an FTE value of 0.68 to produce the consumption per person.
4 The key figures indicated for electricity and heat show the total consumption of both for buildings, as well as for teaching and research activities.
5 The key indicator "energy costs" shows all expenditure (cash out) for the provision of energy (heat and electricity).
6 In energy economics, one refers to primary energy as the energy that is available using the original forms or resources of energy, such as fuel (e. g. coal or natural gas), as well as energy carriers such as sun, wind or nuclear fuels.
7 Final energy is the portion of the primary energy that is left after losses due to energy conversion and transmission after it is supplied via the consumer's domestic connection. The final energy basically corresponds to the energy that is purchased.
8 CO_2 emission factors according to Ecoinvent version 3.71.

FINANCES

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* Extract of the Financial Report 2023.

Financial Report:
www.ethrat.ch/financialreport2023

Consolidated financial statements

Table 1: Statement of financial performance of the ETH Domain (consolidated)

CHF millions	Notes	Budget 2023	Actual 2023	Actual 2022 restated	Change to Actual absolute
Federal financial contribution		2,535	2,535	2,441	94
Federal contribution to accommodation		195	195	202	–6
Total federal contribution	**7**	**2,730**	**2,730**	**2,643**	**87**
Tuition fees, continuing education	**8**	**58**	**61**	**58**	**4**
Swiss National Science Foundation (SNSF), regular research funding		301	272	267	5
Swiss National Science Foundation (SNSF), transitional measures Confederation		n/a	15	1	14
Swiss Innovation Agency (Innosuisse), regular research funding		47	47	44	2
Swiss Innovation Agency (Innosuisse), transitional measures Confederation		n/a	1	–	1
Special federal funding of applied research, regular research funding		91	90	87	3
Special federal funding of applied research, transitional measures Confederation		n/a	2	–	2
EU Framework Programmes for Research and Innovation (EU-FPs), regular research funding		148	106	137	–32
EU Framework Programmes for Research and Innovation (EU-FPs), transitional measures Confederation		n/a	43	17	27
Industry-oriented research (private sector)		145	140	136	4
Other project-oriented third-party funding (incl. cantons, municipalities, international organisations)		103	106	105	1
Research contributions, mandates and scientific services	**9**	**835**	**822**	**795**	**27**
Donations and bequests	**10**	**96**	**159**	**138**	**21**
Other revenue	**11**	**135**	**155**	**146**	**9**
Operating revenue**		**3,854**	**3,929**	**3,780**	**148**
Personnel expenses	5, 12, 28	2,562	2,549	2,503	46
Other operating expenses	13	928	1,037	944	93
Depreciation*	21, 23	286	296	247	49
Transfer expenses	14	138	62	60	2
Operating expenses		**3,915**	**3,944**	**3,754**	**190**
OPERATING RESULT		**– 61**	**– 16**	**26**	**– 42**
NET FINANCE INCOME/EXPENSE**	**15**	**– 2**	**30**	**– 27**	**57**
Share of surplus/deficit of associated entities and joint ventures**	20	–	8	– 25	33
SURPLUS (+) OR DEFICIT (–)		**– 62**	**23**	**– 25**	**48**
**Total revenue		3,852	3,967	3,729	238

* Year 2022 restated as per Note 2.

Table 2: Balance sheet of the ETH Domain (consolidated)

CHF millions	Notes	31.12.2023	31.12.2022 restated	Change absolute
CURRENT ASSETS				
Cash and cash equivalents*	16	1,061	721	340
Current receivables from non-exchange transactions	17	697	622	75
Current receivables from exchange transactions	17	65	72	– 7
Current financial assets and loans*	22	1,124	1,561	– 437
Inventories	18	12	12	–
Prepaid expenses and accrued income	19	60	60	–
Total current assets		**3,018**	**3,048**	**– 29**
NON-CURRENT ASSETS				
Property, plant and equipment*	21	2,136	2,172	– 36
Intangible assets*	21	60	58	2
Non-current receivables from non-exchange transactions	17	1,098	1,045	54
Non-current receivables from exchange transactions	17	–	–	–
Investments in associated entities and joint ventures	20	254	246	8
Non-current financial assets and loans	22	80	72	8
Co-financing	23	105	109	– 4
Total non-current assets		**3,732**	**3,701**	**30**
TOTAL ASSETS		**6,750**	**6,749**	**1**
LIABILITIES				
Current liabilities	24	217	171	46
Current financial liabilities	25	17	17	1
Accrued expenses and deferred income	26	200	194	6
Short-term provisions	27	97	99	– 3
Short-term liabilities		**531**	**480**	**51**
Dedicated third-party funds	29	1,697	1,641	56
Non-current financial liabilities	25	373	382	– 9
Net defined benefit liabilities	28	497	320	176
Long-term provisions	27	519	603	– 84
Long-term liabilities		**3,087**	**2,947**	**140**
Total liabilities		**3,618**	**3,427**	**191**
EQUITY				
Valuation reserves		508	721	– 213
Reserves from associated entities	20	254	246	8
Donations, grants, co-financing		1,024	948	76
Other equity*		1,346	1,407	– 61
Total equity		**3,133**	**3,322**	**– 190**
TOTAL LIABILITIES AND EQUITY		**6,750**	**6,749**	**1**

* Year 2022 restated as per Note 2.

Total federal contribution

There are two views of the total federal contribution in the ETH Domain: according to the statement of financial performance and according to the expenditure ceiling.

The **statement of financial performance** on page 108 shows the surplus (+) or deficit (–) of the ETH Domain in accordance with IPSAS, i.e. all revenue and expenses shown therein are recognised on an accrual basis. In the statement of financial performance, the total federal contribution is made up of the federal financial contribution credit (A231.0181) and the federal contribution to accommodation credit of the ETH Domain (A231.0182). The federal financial contribution funds the operation of the ETH Domain and the accommodation contribution covers the costs for the use of federally owned real estate, which are recognised in the same amount as other operating expenses. In the reporting period, the total federal contribution in the statement of financial performance totalled CHF 2,730.2m and was made up as follows (see Fig. 32 on the right: Credits in the statement of financial performance).

The ERI Dispatch contains the annual expenditure credit for the ETH Domain in the four-year **expenditure ceiling**. This is made up of the federal financial contribution credit (A231.0181) and the investments in buildings under the ETH Domain credit (A202.0134). In the reporting period, the total federal contribution attributable to the expenditure ceiling totalled CHF 2,736.2m and was made up as shown in the Fig. 33, p. 113, Credits in the expenditure ceiling).

An explanation of the total federal contribution from the perspective of the credits approved annually by Parliament as part of the expenditure ceiling is provided below.

The ETH Domain's expenditure ceiling for the 2021–2024 period

In the ERI Dispatch 2021–2024, the Federal Council requested an expenditure ceiling of CHF 10,810.7m for the ETH Domain for the implementation of the Strategic Plan 2021–2024. This corresponds to average annual growth of 2.5% (based on the 2020 budget of CHF 2,556.2m). The expenditure ceiling for the period from 2021 to 2024 was approved on 10 December 2020 with FedD 4 concerning ERI Dispatch 2021 – 2024 (FedD I 2021 72). This includes the costs for the dismantling and disposal of the accelerator facilities at PSI totalling CHF 11 million per year, but not the ceiling-increasing expenditure of CHF 10.4m for the dismantling and disposal of the federal nuclear facilities at PSI. The ETH Domain will probably not be able to utilise CHF 60.5m of the credits attributable to the expenditure ceiling (see Fig. 34 on the right).

Approved credits in 2023

The Federal Assembly approved CHF 2,736.0m in FedD Ia for the 2023 budget for the two credits that count toward the expenditure ceiling. In the course of 2023, CHF 0.2m from third-party funding was added to the investment credit. Compared with the 2022 financial statements (CHF 2,666.2m), the increase was CHF 70.0m. The federal financial contribution (credit A231.0181) amounted to CHF 2,535.0m and the investment credit to CHF 201.2m. As no dedicated reserves were created or released for the investment credit, the ETH Domain received a total of CHF 2,736.2m from the total federal contribution (2022: CHF 2,666.2m).

Figure 32: Credits in the statement of financial performance

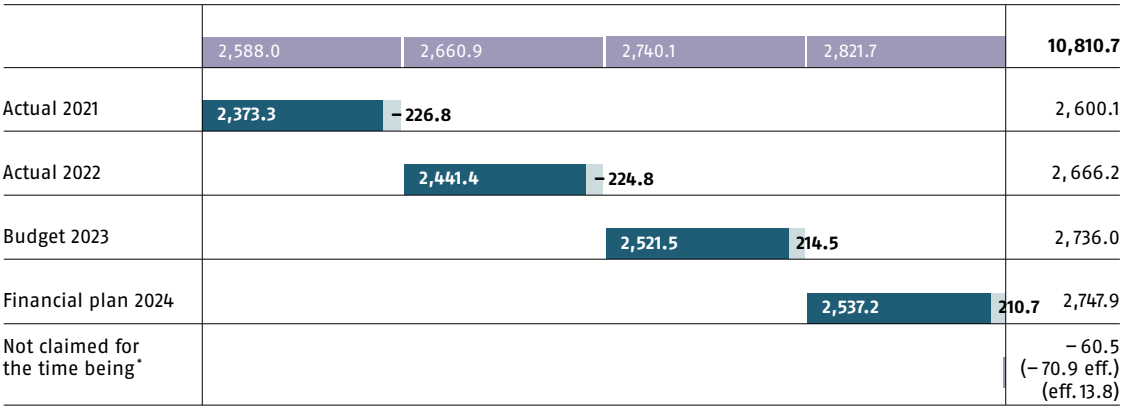
CHF millions	
Federal financial contribution (A231.0181)	2,535.0
Federal contribution to accommodation ETH Domain (A231.0182)	195.2
Total federal financial contribution expenditure ceiling view	**2,730.2**

Figure 33: Credits in the expenditure ceiling

CHF millions	
Federal financial contribution (A231.0181)	2,535.0
Investments in buildings of the ETH Domain (A202.0134)	201.2
Total federal financial contribution expenditure ceiling view	**2,736.2**

Figure 34: Expenditure ceiling and credits for the ETH Domain in the ERI period 2021–2024

CHF millions



* The expected utilisation of the expenditure ceiling for the period 2021–2024 amounts to CHF 10,750.2m. It includes the expenditures of CHF 10.4m for the dismantling and disposal of the Federal Government's nuclear installations at PSI (Decree of the Federal Council of 10 June 2022). These would raise the ceiling in the event that the total expenditure ceiling approved by the Parliament for the 2021–2024 period were to be exceeded.

Budget
Financial plan

A231.0181 Federal financial contribution
A202.0134 Investments in buildings of the ETH Domain

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- the members of the ETH Domain ComTeam (Heads of Communication and their staff),
- the departmental heads and employees of the ETH Board staff and of the institutions of the ETH Domain.

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ETH BOARD

The ETH Domain consists of the two Swiss Federal Institutes of Technology ETH Zurich and EPFL as well as the four federal research institutions, the Paul Scherrer Institute (PSI), WSL, Empa and Eawag. Appointed by the Federal Council, the ETH Board is the strategic governing and supervisory body of the ETH Domain.

www.ethboard.ch

The Institutions of the ETH Domain:

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540 professors, around 25,000 undergraduate and doctoral students, about 4,000 technical and administrative staff members, and around 9,000 scientific employees from about 120 countries: they all research, teach, learn and work at ETH Zurich. Networked globally with the scientific community, and rooted in Switzerland via National Centres of Competence in Research. About 6,000 young people graduate every year, bringing the latest knowledge to Swiss companies. Or they found one of the dozens or so spin-offs established each year in industries with a promising future such as nanotechnology, medtech, cyber security or IT.
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Empa
Empa is the interdisciplinary research institute of the ETH Domain for materials science and technology. On the basis of its research, it develops innovative solutions to meet the biggest challenges currently facing industry and society, and therefore plays a significant role in reinforcing the international capacity and competitiveness of Swiss industry in an increasingly competitive environment. www.empa.ch

Eawag
Eawag is one of the world's leading water research institutes. Its strength and success are based on the combination of research, teaching and further education that it has provided for over 80 years, along with consultancy and the transfer of knowledge. The combination of natural sciences, engineering and social sciences enables comprehensive research into water in relatively untouched rivers and lakes, right through to waste water management systems. www.eawag.ch

Cover page
Professor Thomas Zurbuchen, former NASA research director and now head of ETH I Space, wants to launch one of the world's best interdisciplinary Master's programmes in space systems (see also. p. 15 f.).

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