

ETH ZURICH

Strategic orientation



The photographs in the strategy brochure were taken at the four ETH Zurich sites (Zurich Centre, Zurich Hönggerberg, Ticino and Basel).

Title page: ETH Zurich Hönggerberg campus

Page 2: Zurich as a centre for university education

Page 6-7: ETH Zurich Hönggerberg campus

Page 8: ETH Zurich study area in the Mechanical Engineering building in the city centre

Page 12-13: ETH Zurich Main Building in the city centre

Page 18: Installations floor in the new building of the Centro Svizzero di Calcolo Scientifico (CSCS) in Lugano

Page 20: Science Lounge in the Department of Biosystems Science and Engineering in Basel

Page 26-27: ETH Zurich Hönggerberg campus

Page 34: Recreation room at the Branco Weiss Information Science Laboratory, ETH Zurich Hönggerberg campus

Contents

Foreword from the President	3
Self-image	4
Values	5
Framework conditions	9
Sustainable growth	10
University development	11
Education	14
Research	16
Knowledge and technology transfer	17
Services at national level	19
Partners	21
Thematic focal areas	22
People	28
Management	29
Premises and infrastructure	30
Financing	31
Alumni	32
Communication	33



Foreword from the President

ETH Zurich is helping to shape the future. In its role as a pioneering institution, it aims to try out new approaches, broaden horizons, develop new perspectives and thus play its part in ensuring that our country will be able to hold its own on the global stage – and not just in the short term.

The strength of ETH Zurich lies in its outstanding researchers, talented students and committed staff. Maintaining its appeal as a place for these people to work and study is therefore one of the top priorities for ETH Zurich.

As a Swiss Federal university of international repute, ETH Zurich sees educating young people as one of its most important tasks. Its graduates think for the long term and act sustainably. Their understanding of the complex interactions in the real world is based on sound knowledge of the principles of mathematics and the natural sciences.

One of the ways in which ETH Zurich makes progress is through careful planning. Equally, however, it also seizes opportunities and reacts flexibly to emerging needs. It shares its ideas with partners

from the worlds of academia, society and business, in Switzerland and elsewhere, and works with them to evaluate those ideas.

This “Strategic orientation of ETH Zurich” explains how ETH sees itself, what it hopes to achieve in the near future and where it will set its priorities. It has been produced by the Strategy Committee in collaboration with the Executive Board, and is based on the strategic plans of the individual departments. It is the result of intensive discussions with a great many interested parties, whom I would like to thank most sincerely for their excellent suggestions and for thinking so carefully about the aims of a first-class university.

As President, I am responsible for the strategic orientation of ETH Zurich. It is good to know that it is backed by the whole of ETH.

R. Eichler

Ralph Eichler, President of ETH Zurich

Self-image

ETH Zurich sees itself as an institution with regional and national roots that is fully integrated in the international academic community. In its education and research, as well as in its mode of operating, it measures itself against the world's leading universities.

ETH Zurich produces new knowledge, combines it with tried and tested insights and passes it on to its students and to society at large. It focuses on basic principles in research and education.

ETH Zurich strives to meet the needs of society, from the local to the global level.

The excellence of ETH Zurich is based on:

- attracting the best-qualified staff as well as highly motivated and talented students,
- high expectations of its students, staff and professors,
- a culture of trust in the academic and ethical standards of its members,
- the freedom of its professors and staff to plan their own work,

- appropriate funding and an excellent infrastructure for its educational and research activities,
- giving all university groups a say in overarching decision-making processes.

ETH Zurich is the leading centre for education and training for Switzerland's technical and scientific elites. It meets this responsibility by engaging in top quality education and research based on first principles to increase people's understanding of complex interactions. Its members and graduates play an important role in the transfer of knowledge and technology into society and the economy. In this way, ETH Zurich is at the service of society and makes a major contribution to securing the international competitiveness and innovative strength of Switzerland as a centre of economic and intellectual activity.

Values

ETH Zurich encourages a culture of empowerment. It makes space for creativity and supports innovative ideas.

The distinguishing feature of an education at ETH Zurich is the emphasis given to providing students with sound knowledge of mathematics and other fundamental sciences to all students.

A university education at ETH Zurich is inseparably linked to fundamental research at the highest level. All members of ETH Zurich who are engaged in research play a part in the teaching of the students. In their turn, students become involved in research as early as possible.

ETH Zurich is committed to academic diversity, which enables specialist knowledge to be combined in original and ground-breaking ways. The humanities and social and management sciences form an integral part of its range of subjects and are, indeed, essential in taking an all-round approach to tackling the problems of society.

In its cutting-edge and creative education and research, ETH Zurich relies on **the diverse talents of its members** and the expertise of its staff, of both genders and all ages, regardless of their cultural, religious or social background. **Paying keen attention to opinion-forming processes** helps achieve consensus and promotes an institutional identity.

Sustainability is an integral part of the research, education and mode of operating at ETH Zurich and is a key element of university life.





Framework conditions

ETH Zurich owes the excellent conditions under which it operates to the **farsightedness of its sponsor – the Swiss Confederation**. It is these conditions which enable it to hold its own in the international competition for the best researchers and Master students, and which permit its members to produce outstanding performances in education and research. Crucial competitive advantages include the initial endowment and the education and research infrastructure which ETH Zurich is able to provide for its research groups and students, and, of course, its high degree of autonomy.

ETH Zurich has a flat department-based organisational structure, which allows a strong bond to be formed between education and research. Interdepartmental competence centres enable new thematic subject areas to be incorporated in a flexible way. The management culture at ETH Zurich is based on subsidiarity, which enables the diversity of methods and research priorities essential for the long-term success of a university to be handled efficiently.

Sustainable growth

ETH Zurich endeavours to develop its human and financial resources and its infrastructure in ways that are designed to raise standards. Growth is only an objective if it brings benefits in terms of quality. However, demographic, academic and technological developments, combined with the rise in third-party funding that science policy requires and ETH's ever-increasing national and international appeal, are leading to overall growth at ETH Zurich.

In its plans for the future, ETH Zurich is forecasting moderate growth and, by the year 2020, expects to have approximately 20,000 students, 1000 professors and senior scientists, and a budget of 2 billion Swiss francs.

University development

ETH Zurich continuously develops its range of subjects and its structures, primarily through strategic planning by the Executive Board and the departments, planning of professorships, curriculum development, regular evaluation of the departments by international committees of experts, its own management information systems and dialogue between the Executive Board and the departments. By integrating bottom-up initiatives at Executive Board level, ETH Zurich can ensure that it is able to identify and shape promising developments in science at an early stage.

The bodies with overall responsibility for researching the basic principles within their disciplines are the departments of ETH Zurich. The flat departmental structure of ETH Zurich remains flexible thanks to interdepartmental strategic initiatives and competence centres. In this way, new areas of research and education can quickly be reflected in the organisational structures, so that developments in science can be properly pursued.

For the early identification and development of promising areas of science and educational trends, ETH relies on the expertise of its scientific staff and their global network of contacts, the feedback from international committees of experts and the success of its schemes to promote new talent.



Education

By educating highly motivated and talented young people, ETH Zurich is making an important contribution to the creation of a technical and scientific elite serving Swiss society, academia and business. Its graduates are trained to think independently.

ETH Zurich teaches the fundamental principles required to tackle current and future issues in the natural and engineering sciences, mathematics and architecture, and it inspires enthusiasm for these subjects in its students.

Having the right, motivated students and lecturers is an essential requirement if ETH Zurich is to fulfil its statutory mandate in terms of education, research and knowledge transfer. Attracting and retaining these people is therefore one of the institution's primary objectives. It also hopes in future to encourage more women to study natural and engineering sciences.

Holders of a recognised Swiss matriculation certificate (Matura) are admitted to Bachelor courses at ETH Zurich with no further requirements.

Bachelor

Bachelor degree courses at ETH Zurich teach theoretical principles in scientific and technical subjects.

The attractive range of courses is aimed primarily at students from Swiss upper grammar schools. The Bachelor course is intended to equip students to take a Master degree at ETH or another leading international university.

Holders of a Bachelor degree from ETH Zurich will be permitted to continue onto a Master course at ETH Zurich with no further requirements.

Master

At Master level, ETH Zurich provides its students with a stimulating international setting which offers them the best preparation for their future working environment or for taking a doctorate in Switzerland or elsewhere. It accepts a considerable number of external students (national and international) on its Master courses, provided they meet the required standard of performance, and it exercises its right to make admission to a Master course subject to certain quality criteria and limitations on capacity.

Doctorate

At doctoral level, ETH Zurich admits candidates on the strength of their academic performance and potential. Doctoral theses at ETH Zurich meet the highest international standards and make a major contribution to the international reputation of ETH Zurich among the research community.

Continuing education

The academic continuing education provided by ETH is based on the needs of society, the individual requirements of participants and of companies and organisations and, not least, the scientific interests and available capacity of the teaching staff at ETH Zurich.

At every stage of education, there is an element of internationalism, as appropriate to the academic objectives of the course. The admission criteria for courses at ETH are transparent and are applied consistently and across the board. At Master level, students are selected on the basis of their performance and the available capacity.

Research

Research is the main source of innovation in knowledge-based societies and underpins a university education. Through its research, ETH Zurich makes an important contribution to the well-being of society and to the long-term competitiveness of the Swiss economy. It aims to strengthen its position as a research university even further and thus will also reinforce the international reputation of Switzerland as a centre for education, research and business.

ETH Zurich defines itself primarily by the quality of its scientists and the fields of research it pursues. It is these that largely determine the ethos of the university, its educational activities and the achievements of its researchers and students.

Research today is highly technology-based. That is why ETH Zurich develops and uses the very latest technologies in its research. This requires both investment and highly skilled staff who are able to maintain and develop complex technological infrastructures. ETH Zurich already runs numerous technology platforms, sometimes in partnership with other academic institutions or with industry, in Zurich as a centre for higher education or on behalf of all Swiss universities (e.g. the Swiss National Supercomputing Centre).

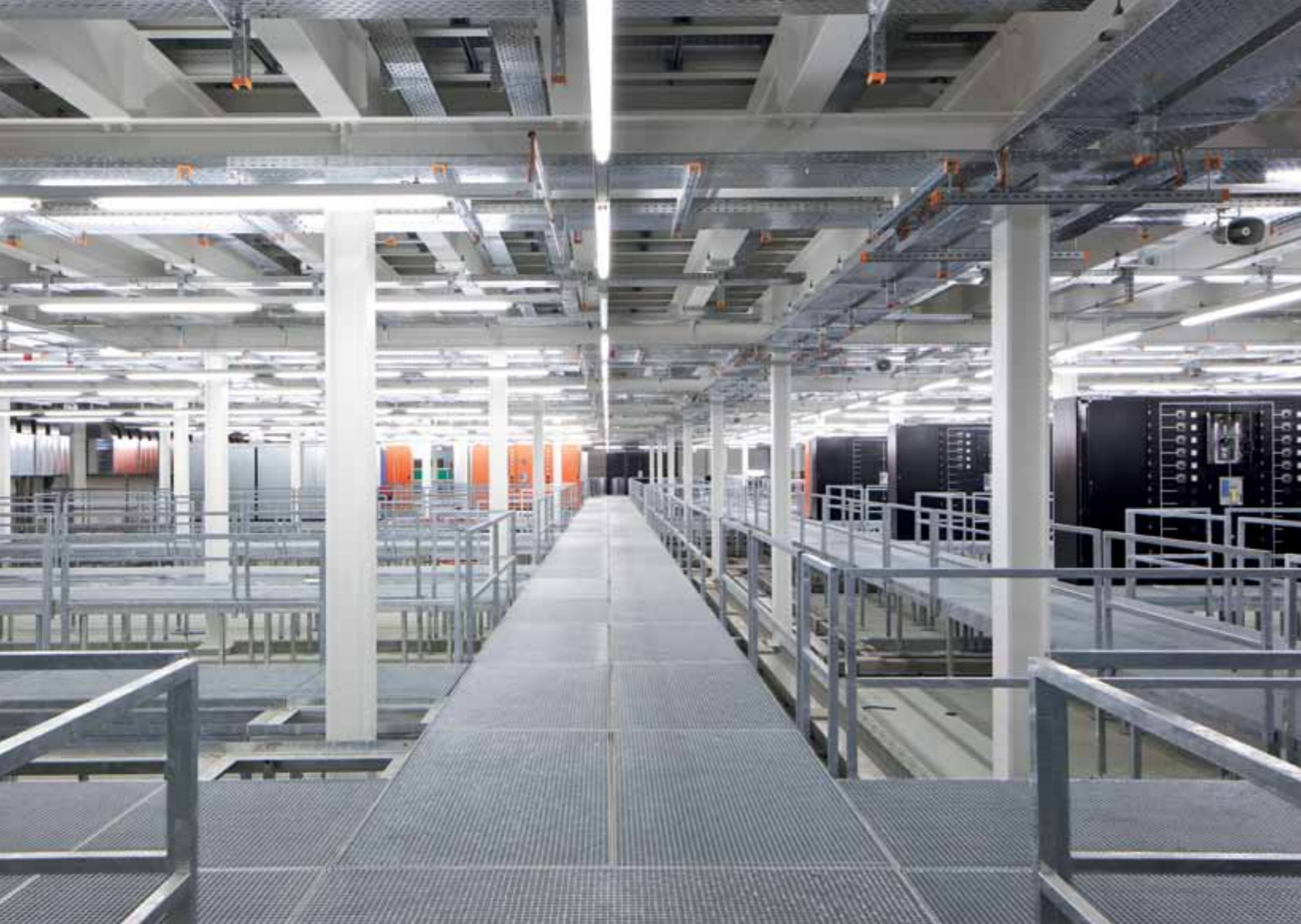
ETH Zurich supports fundamental research at the highest level. In future, research technologies will increasingly be organised in the form of platforms. These encourage interdisciplinary collaboration, cut costs and enable the staff involved to operate more professionally.

Knowledge and technology transfer

Transferring the results of its research into practical areas of application is one of the key responsibilities of ETH Zurich. In this way, the institution makes an important contribution to maintaining Switzerland's strength in innovation and long-term competitiveness. Scientific findings and innovations should be used for the benefit of society, the political sphere and the economy. ETH Zurich is the foremost academic partner for the knowledge and technology transfer of leading Swiss companies. It aims to strengthen this role even further.

Knowledge transfer is mainly carried out not only by the graduates of ETH Zurich, but also by the researchers who contribute their expertise by working with business, or who, after a successful career in research and teaching at ETH, move on into business or administration. This is why ETH Zurich nurtures a culture where its members at all levels can take the initiative and are alert to the needs of society and industry. Knowledge and technology transfer and entrepreneurial skills form an integral part of education and research at ETH.

The transfer of knowledge and technology between the university, society and business is a top priority for ETH Zurich. It wants to equip its students to solve complex problems of all kinds, quickly and independently. ETH Zurich also offers companies of all sizes access to its latest research results, and encourages collaboration between the university and industry.



Services at national level

On the back of its now long-established role and leading position in research, ETH Zurich performs all kinds of services for Swiss society and industry. The sponsors of these services are based in an academic environment, enabling the fruitful and necessary interplay between research activities and practical implementation.

The national responsibilities of ETH Zurich include operating key **scientific services** such as:

- the Swiss Seismological Service SED (www.seismo.ethz.ch)
- the Swiss Institute for Business Cycle Research KOF (www.kof.ethz.ch)
- the Swiss National Supercomputing Centre CSCS (www.cscs.ch)
- the ETH-Bibliothek (www.library.ethz.ch)
- the Atlas of Switzerland / Swiss World Atlas (www.atlasderschweiz.ch / www.schweizerweltatlas.ch)
- the Centro Stefano Franscini / Villa Garbald conference centres (www.csf.ethz.ch / www.garbald.ch)

With its scientific services and careful preservation of Swiss cultural heritage, ETH Zurich performs important duties for the nation.

In addition, **preserving Swiss cultural heritage** is also part of the national role played by ETH Zurich. To this end, it maintains:

- the Collection of Prints and Drawings (www.gs.ethz.ch)
- the Archives of Contemporary History (www.afz.ethz.ch)
- the Werner Oechslin Library (www.bibliothek-oechslin.ch)
- the gta Archives (History and Theory of Architecture) (www.archiv.gta.arch.ethz.ch)
- the Thomas Mann Archiv (www.tma.ethz.ch)
- the Max Frisch Archive (www.mfa.ethz.ch)
- various other special collections and archives (www.ethz.ch/libraries/collections)



Partners

ETH Zurich bears special responsibility for ensuring the future viability of higher education in Switzerland and therefore the well-being of the country. In order to carry out this responsibility properly, it is strengthening its position in Switzerland's political system.

Together with its partners in Switzerland and elsewhere, ETH Zurich is endeavouring to broaden the spectrum of educational and research opportunities in Switzerland. One of the benefits of partnerships between specialist institutions is that they can each retain their own particular strengths. When it comes to institutional partnerships, geographical proximity is of key importance.

ETH Zurich maintains close partnerships with the institutions in the ETH Domain and benefits especially from the mutually complementary areas of interest of the research organisations that make up the ETH Domain.

ETH Zurich has **campuses in Zurich, Basel and Lugano**. There are no plans to add more campuses.

ETH Zurich is a preferred partner for leading national and international universities. It benefits from its strong roots in Zurich as a centre for higher education.

Thematic focal areas

To complement the research activities of the various departments, ETH also supports the creation of thematic focal areas, which allow for cross-departmental research. These thematic focal areas enable research to be organised dynamically, so that temporary competence centres may be set up, or even an entirely new department created, depending on how research work develops. There are currently five thematic focal areas which are notable for the intensity of their interaction and the level of support concentrated upon them:

- Sustainable worlds
- Technology and knowledge for health
- Complex systems
- Materials, technologies and industrial processes
- Scientific foundations of the future

Sustainable worlds

Over the coming years, ETH Zurich intends to continue strengthening its position as an international reference centre and centre of excellence for research on the environment and sustainability. In the thematic focal area “Sustainable worlds”, ETH has brought together three fields of research which are particularly topical for scientists today and of enormous importance for society:

Current debates about energy and climate policy have created a fundamental political openness about the future, but also numerous fascinating challenges in terms of science and technology. For that reason, a number of interdisciplinary competence centres at ETH Zurich in this subject area are working on **energy and climate research**.

With the **Future Cities Laboratory** that was established in 2010, ETH Zurich is taking an innovative approach to global research cooperation. On the CREATE campus sponsored by the National Research Foundation in Singapore and other international partners, ETH Zurich is building a laboratory for designing the sustainable cities of the future.

From 2012, Agricultural Sciences and Environmental Sciences will be merged in a **new Department of Environmental Systems Science**. This will enable sustainable agriculture, a fundamental prerequisite for global food security, to be given a higher priority.

Technology and knowledge for health

ETH Zurich is making use of its wide range of different disciplines and its technical excellence to enable it to explore new areas of research at the interface of health sciences and technology in the near future. To this end, in 2012 it will be setting up a **new Department of Health Science and Technology**. The new department will bring together the subject areas of food sciences and nutrition, human movement sciences, neurosciences and medical technology. This will be the main link between ETH and the **Hochschulmedizin Zürich** project, a joint undertaking by ETH, the University of Zurich and University Hospital Zurich. This organisation will combine clinical medicine, fundamental biomedical research and engineering sciences and will encourage innovative, cross-disciplinary research and education in translational and personalised medicine. Hochschulmedizin Zürich is one of the pillars of the *Swiss Health Research – healthX.ch* – initiative being run by ETH Zurich, EPFL and the PSI.

Complex systems

A constant challenge for science is to break down complexity. It succeeds if it is able to use new models, concepts or explanations to take a more sophisticated approach to natural phenomena, apply technology efficiently and enable society to act in a well-informed way. In the thematic focal area “Complex systems”, ETH Zurich is concentrating simultaneously on a particularly powerful research tool and particularly topical areas of complexity: computer-assisted modelling, learning systems and risk research.

ETH Zurich was one of the pioneers of **computational science** and promotes modelling and simulation – along with theory and experimentation – as the third pillar of scientific research. Many research groups at ETH Zurich use the methods of computational science and are developing them further. Computational science also plays a central role in gaining maximum benefit from the national *High Performance Computing and Networking Initiative*, as part of which the Swiss National Supercomputing Centre of ETH Zurich in Lugano is being expanded.

Risks of all kinds are explored in a number of specialist areas of ETH Zurich. These education and research activities have been consolidated in the newly established Risk Center in order to gain

a holistic view of the different types of risk. ETH Zurich hopes that this will soon make it one of the leading centres for **integrated risk research**.

In the future, autonomous, learning systems will be able to support humans in all kinds of situations. In partnership with the Max-Planck-Institute for Intelligent Systems in Stuttgart, ETH Zurich plans to study the basic principles for developing this type of system.

Materials, technologies and industrial processes

The development of ultra-strong materials, composites and resource-efficient processing techniques are permanently reducing the energy consumption of industrial enterprises. Modern manufacturing plants therefore require computer-assisted **design methods**, powerful tools for **material flow planning**, the **integration of complex materials** and methods for organising operational processes efficiently. This is what is to be studied in the “Materials, technologies and industrial processes” thematic focal area at ETH. Fundamental research into procedures and methods for identifying controllable, reproducible and scalable processes and manufacturing procedures as well as the handling of component dimensions

across several orders of magnitude are at the heart of the “*Manufacturing across Scales – from Nano to Macro*” initiative.

Scientific foundations of the future

ETH Zurich plays an important role in mastering the current and, above all, future challenges facing mankind. That is why it is making a significant investment in exploring the scientific principles of the future.

Quantum mechanics is one of the most successful theories of modern science. It is still hard to predict the direction in which the most important applications of **quantum technology** will ultimately be developed. However, the use of high-quality **technology**, combined with the principles of quantum physics – which are being applied and explored not only in physics, but also in chemistry, electrical engineering and computer science – gives good grounds for anticipating that some interesting applications will develop from these basic principles. ETH Zurich is one of the pioneers in this promising subject area and is leading the National Centre of Competence in Research “Quantum Science and Technology”.

The decoding of **ultra-fast processes on a molecular scale** is leading to a deeper understanding of the structural and dynamic behaviour

of matter at atomic level. This understanding is a fundamental prerequisite for tackling the big challenges of the future, such as discovering new energy sources, developing new processes for making complex drugs or improving electronic components such as the processors or memory chips in computers. ETH Zurich is leading the National Centre of Competence in Research “Molecular Ultrafast Science and Technology”.

Systems biology aims for a comprehensive understanding of biological processes and involves researching the interaction between the different elements in an organism. At ETH Zurich, its research is primarily focused in a department of its own in Basel. Systems biology seeks out information which is not apparent from studying the components of a system in isolation. This holistic approach should one day make it possible to model living systems. In order to pursue this approach, interdisciplinary cooperation between the life sciences and clinical medicine, chemistry, physics and mathematics, not to mention computer science and the engineering disciplines, is absolutely essential. ETH Zurich is leading the Swiss initiative to develop systems biology, SystemsX.ch.



People

Outstanding scientists, promising young talent and excellent administrative and technical staff: these are all essential if ETH Zurich is to fulfil its statutory mandate and achieve its strategic goals. It therefore aims to create an environment which will enable it to attract, promote and retain such people. An important part of this is a management culture that is defined by responsibility and respect and is appropriate for the academic environment.

ETH Zurich is supported by a scientifically outstanding international body of professors. In the orientation of its professorships, ETH Zurich believes in the importance of providing an excellent education for its students in the basic principles of their specialist fields. The number of professorships is based on the strategic focal areas for research and education, and on the long-term needs of society. With this in mind, ETH Zurich consistently aligns the planning of its professorships with its strategic planning, while at the same time always seizing any opportunities that may arise to appoint excellent researchers.

The most important instrument in the strategic positioning of ETH Zurich is the upholding of a rigorous policy of excellence when making appointments. ETH will continue in future to appoint professors from all over the world, regardless of their nationality, gender or origins.

Management

ETH Zurich is aware of its responsibilities as an autonomous university of science and technology. It is committed to focusing on results and transparency.

Effective and efficient management structures help to bring about high standards in education and research and give ETH Zurich a leading position in the national and international environment. In particular, ETH Zurich is increasing the autonomy of its constituent entities. University groups are included in important decision-making processes.

In keeping with ETH's 'culture of empowerment', departments and research groups enjoy a high degree of financial autonomy, enabling them to make important decisions about their own future. Clear processes and binding guidelines ensure that people have confidence in ETH Zurich.

Premises and infrastructure

A modern and high-quality infrastructure is one of the essential prerequisites if ETH Zurich is to deliver excellent service in research and education. This is one of the factors for success in attracting talented people and highly-qualified personnel, from the students and the scientific, administrative and technical staff through to the professors.

Maintaining its technical infrastructure and facilities in a sustainable way, and regularly updating laboratory equipment, are key concerns for ETH Zurich, and this is reflected in careful budgeting.

In order to alleviate existing bottlenecks and allow for further development in both research and education, ETH Zurich plans to invest a total of one billion Swiss francs into upgrading its physical infrastructure between 2011 and 2016.

Financing

The academic development of ETH Zurich is only made possible by long-term, sustainable funding. On the one hand, this guarantees security in planning and, on the other, it allows for sufficient flexibility to be able to react swiftly to new scientific developments. The principle of subsidiarity applies: the available resources are managed integrally and autonomously at the level of departments and professorships.

ETH Zurich uses its resources as efficiently as possible for education and research and for the infrastructure that supports them. Resources are allocated on the basis of requirements, results and the overall strategy. The basic endowment for a professorship funds the professor's teaching responsibilities and permits research with an uncertain outcome to be carried out, and third-party funding to be acquired.

ETH Zurich has a financial plan covering several years and the total needs of the institution, and a long-term balance sheet management system to cover current obligations.

To support its sustainable financing strategy, ETH Zurich works closely with the ETH Zurich Foundation. The Foundation forms long-term partnerships with companies, organisations and private individuals in order to supplement the public funding for ETH Zurich with targeted private funding, and so speed up the implementation of the academic strategy.

The huge success of ETH Zurich in acquiring third-party funding has led to a shortage of space and has put a strain on its infrastructure and central services. The overheads entailed by additional research funding must be covered in future.

Alumni

Graduates from ETH Zurich are among its best ambassadors in society, science and business, both in Switzerland and worldwide. With their commitment and their achievements in all fields, they significantly enhance the reputation of their alma mater. Their active support and critical analysis of the university's activities are very important in underpinning the forward-looking development of ETH Zurich for the good of science, society and the economy.

ETH Zurich nurtures relationships with its former members and students all over the world. It benefits from their critical analysis for the forward-looking further development of the university.

Communication

Communication is essential for all universities. Maintaining a dialogue and being understood by the people it addresses is very important to ETH Zurich. At the most basic level, ETH Zurich reports regularly on its activities, its research results and the expected and possible consequences of new findings. In this way, it plays an important role in providing information and in contributing to social and political opinion-forming processes.

The wide range of topics that are dealt with at ETH, but also the large number of people with an interest in the university, mean that communication takes place in all kinds of different locations, with a rich diversity of channels of communication. These range from internal committees, working groups and commissions to scientific conferences and workshops, and use of a university campus as a venue for public platforms and information events.

Greater use should be made in future of the campus as a place for interactive communication, not least with an eye to the development of Zurich as a centre for higher education.



Imprint

Publisher: Executive Board of ETH Zurich

Editors: Strategy Committee of ETH Zurich: Prof. Dr. David Gugerli, Prof. Dr. Nina Buchmann, Prof. Dr. Lino Guzzella, Prof. Dr. Andreas Toennesmann, Prof. Dr. Wilfred van Gunsteren, Daniel Fischer, Jannick Griner, Roman Kappeler, Nicholas Preyss, Christophe Schneble, Katharina Poiger Ruloff

Layout and Visual Concept: Andreas Fiersbach, Corporate Communications

Pictures: Marco Carocari

Scientific Illustrations: Prof. Dr. Richard Pink, Philipp Simmler, Departement of Mathematics

Printing: Neidhart + Schön AG, Zurich

Circulation: 5000

© ETH Zurich, October 2011

The brochure can be obtained in German, English and French from:
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The detailed Strategy and Development Plan for ETH Zurich for the period 2012-2016 can be downloaded from the web page <http://www.ethz.ch/about/strategy>. The report is only available in German.



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