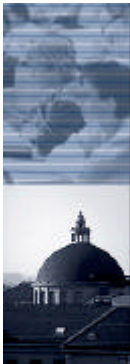




Models Actuals de Formació de l'Enginyer a Europa: ETH Zürich

Prof. Dr. Dr.h.c. Konrad Osterwalder, Rector ETH Zürich



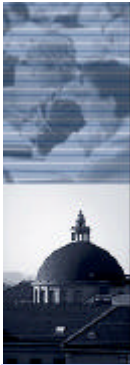
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a Europa

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K. Osterwalder
Rektor, ETH Zürich

Topics

- **Higher Education in Switzerland**
- **ETH**
 - Programmes
 - Students
 - Professors
 - Finances
- **Innovating Teaching**
 - Bologna Reform
 - Quality
 - New Teaching Technologies
 - Networking, Internationalization



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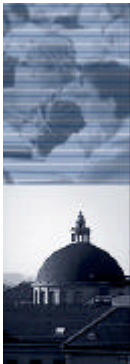
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Switzerland



- **Population: 7.1 mio.**
 Out of which 1.2 mio
 foreign nationals
- **Area: 41'300 km²**
- **Languages:**
German (65%)
French (18%)
Italian (12%)
Romanch (1%)

Bundesamt für Statistik 1997/98

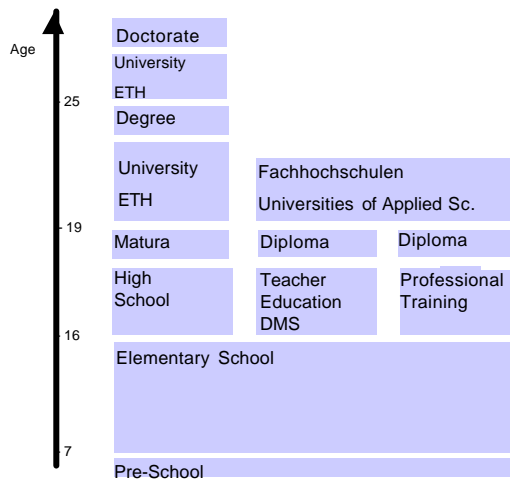


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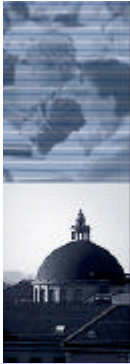
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Educational System



Swiss Higher Education



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10 cantonal universities

Geneva
 Lausanne
 Neuchâtel
 Bern
 Basel
 Zurich
 Lucerne
 St. Gallen
 Ticino

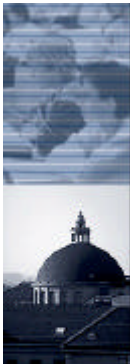
2 federal institutions

EPF Lausanne
 ETH Zurich

+ 7 Universities of Applied Sciences („Fachhochschulen“)

Swiss Universities

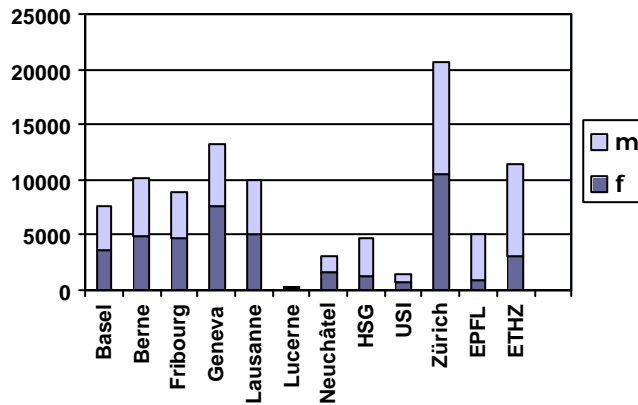
Students 2000



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Bundesamt für Statistik 2000

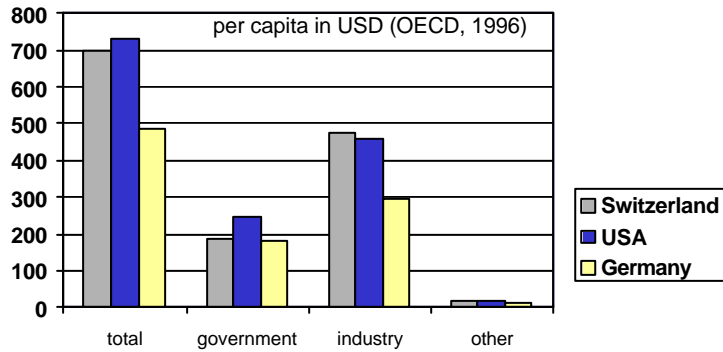
Expenditure on R&D



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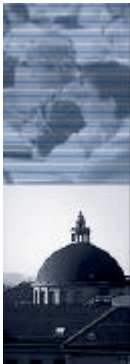
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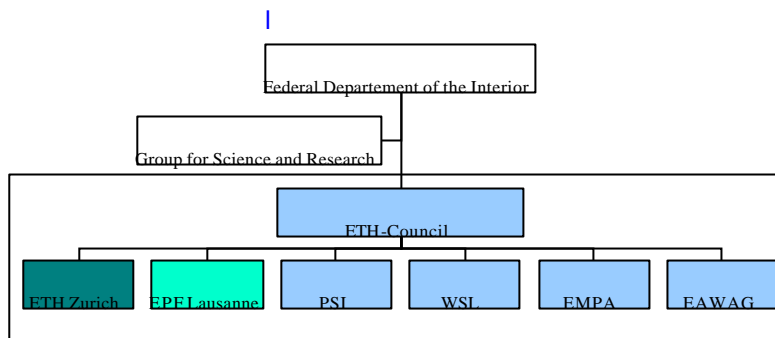
ETH Domain



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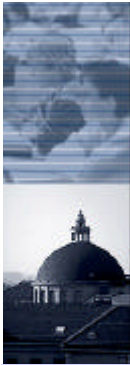
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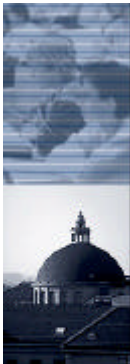
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■ Higher Education in Switzerland

■ **ETH**

- Programs
- Students
- Faculty
- Finances

■ Innovating Teaching



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Key figures (2002)

Graduates (Diplom)	9570
out of which foreigners	1052 (11%)
PhD & postgraduate students	2820
out of which foreigners	1354 (48%)
Professors	340
out of which foreigners	194 (57%)
Personnel (full time eq.)	5417
Budget	1084 Mio. SFr.
	0.7 billion US\$

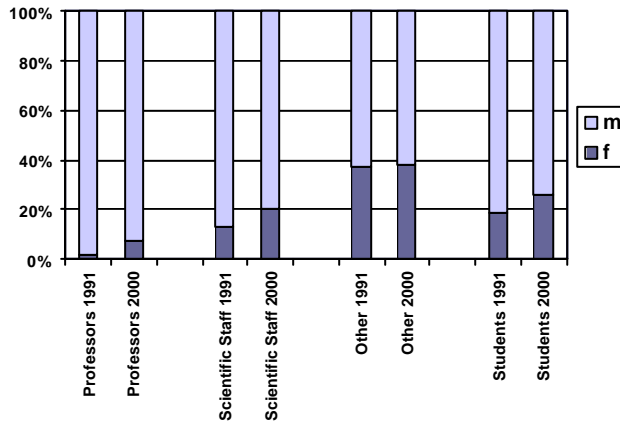
Proportion of Women as % of Total



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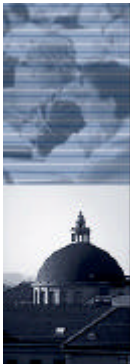
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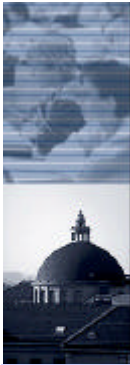
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Structure: 16 plus 1 Departments

Construction and Geomatics (2)

Architecture; Building, Environment and Geomatics.

Engineering Sciences (5)

Mechanical and Process Engineering; Information Technology and Electrical Engineering; Computer Sciences; Materials; Industrial Management and Manufacturing.

Natural Sciences and Mathematics (4)

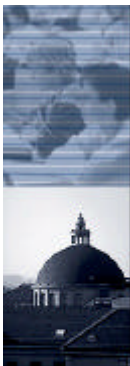
Mathematics; Physics; Chemistry; Biology.

System-Oriented Sciences (5)

Earth Sciences; Environmental Sciences; Applied Biosciences; Agricultural and Food Sciences; Forest Sciences.

Humanities, Social and Political Sciences (1)

Humanities, Social and Political Sciences.

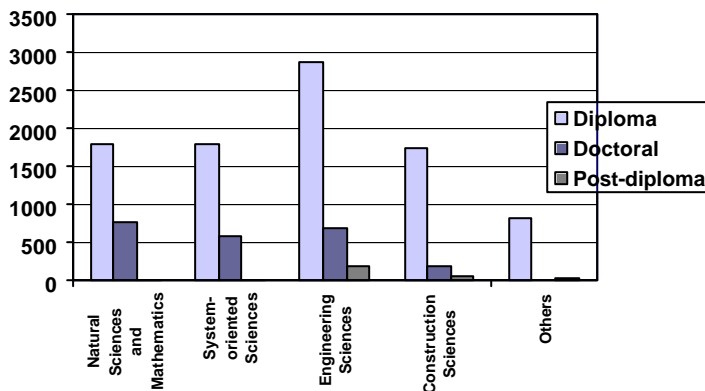


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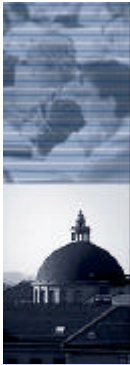
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Students in the 4 domains (2000)



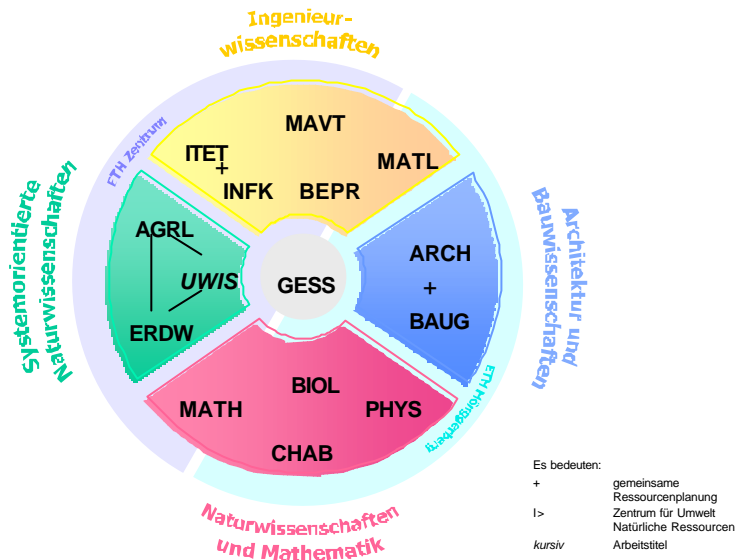
Strategy



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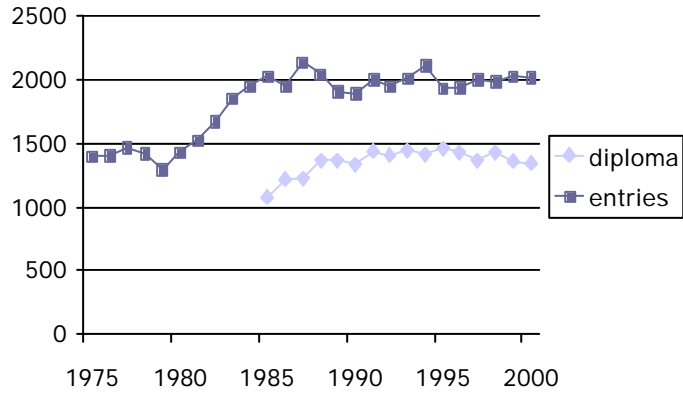
Diploma Students



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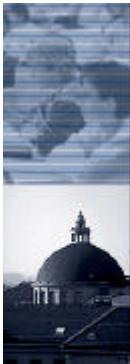
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Incl. Prof. Off. of the Swiss Armed Forces, Phys. Educ. and Sports Teacher

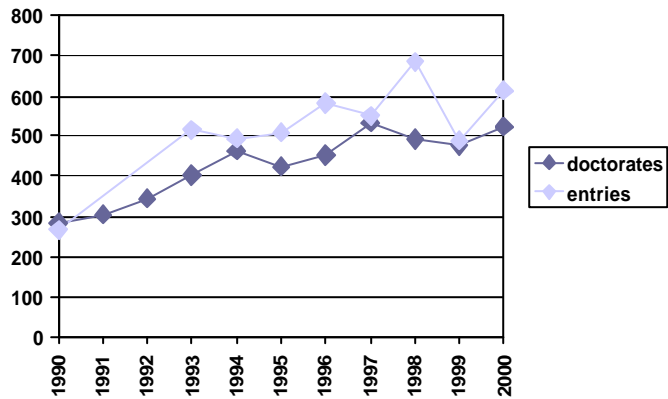
Doctoral Students



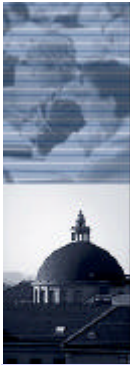
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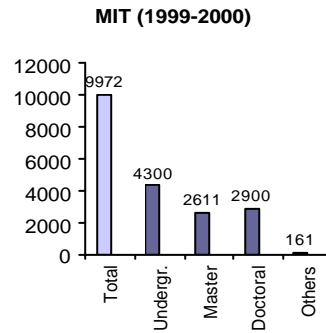
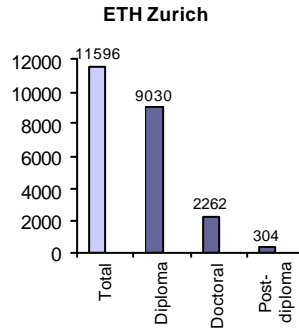
Students (2000)



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Nationality of students

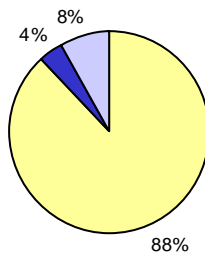


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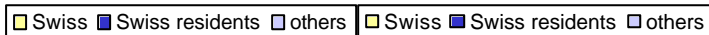
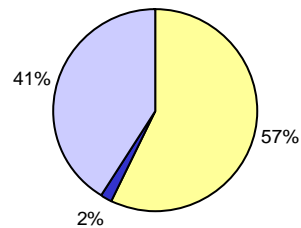
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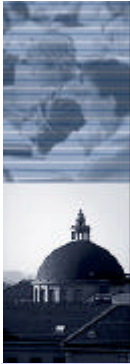
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Diploma



Doctoral / post-diploma



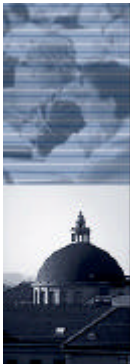


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- **Higher Education in Switzerland**
- **ETH**
 - Programmes
 - Students
 - **Faculty**
 - Finances
- **Innovating Teaching**



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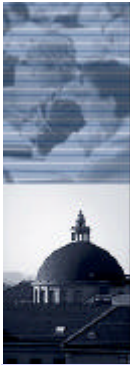
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Faculty search and nominations ©OK (top priority, presidential responsibility)

- **Shared process with strong feedback**
- **Search committees chaired by personal delegates of the president**
- **Head hunting through global faculty networks**
- **Strong engagement of target departments**
- **Final verification (~90%) by the president**
- **Embodiment of ETH culture**

Nominations – Applications ©OK

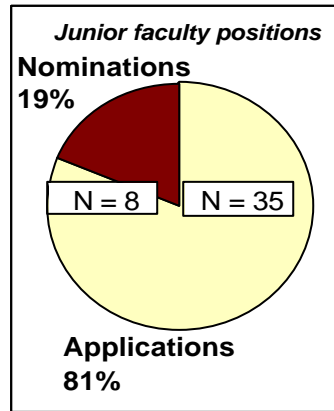
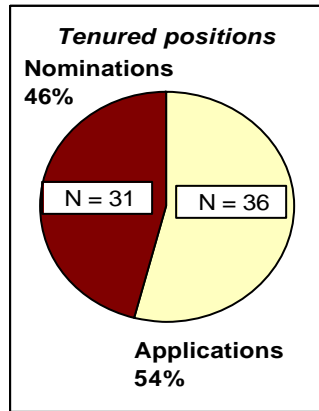
New Faculty 98-01:



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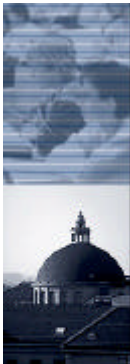
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11.1.02 Bre/ü

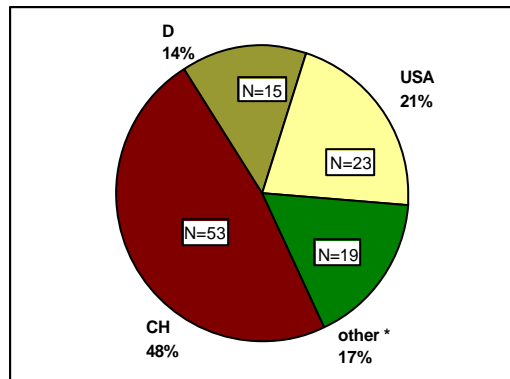
New Faculty 1998-2001 ©OK Recruited from:



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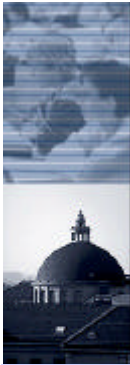
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*

Austria	3
Benelux	4
France	4
UK	4
Italy	1
Japan	1
Scand	2

11.1.02 Bre/ü



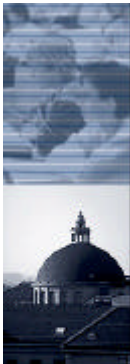
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Talent fostering ©OK Assistant professors with Tenure Track

- Official adoption by both ETH in 2000/2001
- Continuous appointments
- Implementation of a structured tenure process
- Periodical reporting and positioning
- Establishment of an ETH-wide tenure committee



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- Innovating Teaching

Budget

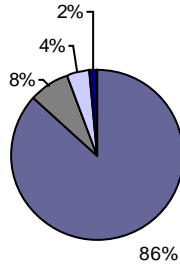


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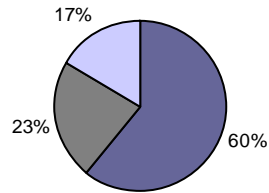
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Income (2000)



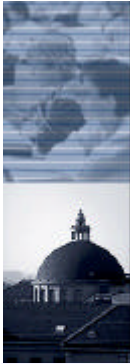
Expenditure (2000)



federal budget
 project funding
 private sector
 fees

staff
 investments
 running costs

Expenditures per Student (2001)

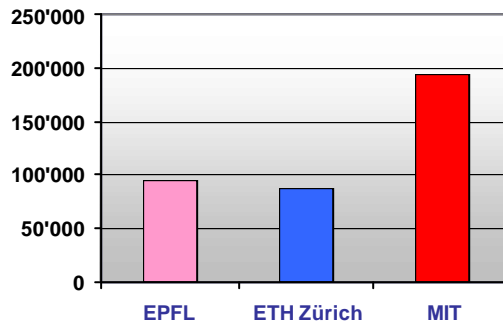


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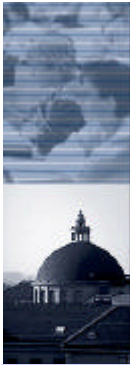
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CHF (1 € = 1.5 CHR)



EPFL
 ETH Zürich
 MIT

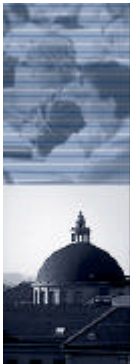


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- **Higher Education in Switzerland**
- **ETH**
- **Innovating Teaching**
 - **Goals**
 - (Bologna) Reform
 - Quality
 - New Teaching Technologies
 - Networking, Internationalization



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Our main goals in teaching and learning

Highest Quality through:

- **dedicated and competent teachers**
- **qualified students**
- **flexible and focused curricula**
- **research based and research oriented teaching**
- **Co-operation with industry and alumni**
- **international collaboration**
- **advanced infra-structure**

The Profile of ETH Engineering Graduates



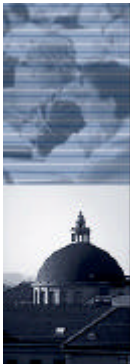
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- have solid knowledge in the basic sciences
- have a scientific education with some research experience in their proper field
- are able to connect to fields outside their specialization
- continue to learn independently
- are able to take up a leadership responsibility shortly after they have left the university
- are fluent in English (ideally: mother-tongue + english + one)
- find their way in foreign cultures
- are being sought after in the international labour market

Curricular Reform: Goals



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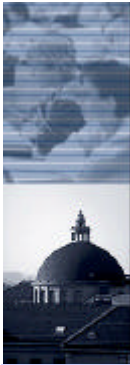
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- **Reorientation towards the Needs of the Modern Society (Politics, Economy, Individuals):**
 - International compatibility
 - Increase Student's Mobility (between disciplines and geographically)
 - Simplification and flexibilisation of the Curricula
 - Transparency in performance control
 - Quality Enhancement

Therefore:

Institution-wide and Fundamental Curricular Reform

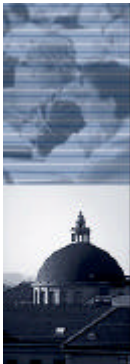


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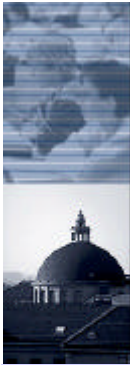
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ESIB: Bologna Process in Switzerland

ESIB condemns the way the Bologna Declaration in Switzerland is implemented. Switzerland gives a pitiful example of “bad practice” concerning:

- selective access to Master studies
- a narrow interpretation of the ECTS key features
- the implementation of assessment years
- not introducing a grant system that is fair and harmonised within even only Switzerland
- the policy of tuition fees
- not respecting the 80% of Swiss students that are working part-time

(Bologna) - Reform ©KO



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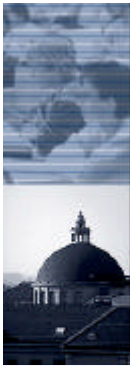
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includes all aspects:

- Curricula
 - Structure: undergraduate, graduate, doctoral levels
 - Teaching methods and technologies
 - Performance control: ECTS, Examinations, etc.
 - Student administration
-
- Quality Assurance in every Step
 - → Completion 2005

To study at ETH Zürich

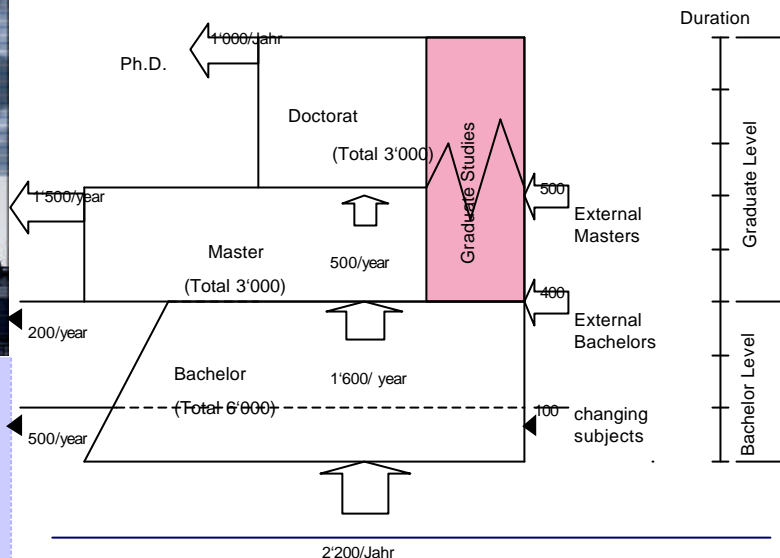
Zahlen: Stand heute



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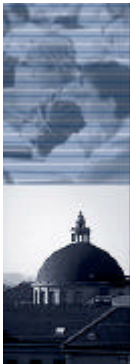
NewProfiles Undergraduate

Core Competences

- Broad Education in Basic Sciences: Math, Physics Chemistry, Computer Science, Biology
 - Solid **Basic** Knowledge of the Discipline
 - Methodological and Scientific Thinking
 - Including Humanities and Social Sciences
 - Scientific english (starting year 2)
 - Experience in team work, practical work
-
- Optimal Preparation for Graduate Programmes at ETH and at other leading Universities worldwide
 - Concentration and advanced placement in Master Courses possible
 - No particular preparation for entering the job market
 - ~~Limited study time: < 5 years~~

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New Profiles: Graduates (Master)

- Scientific Specialization
- First Research experience through collaboration in a research group
- Master thesis (~6 Months)
- fast tracks into the doctorate for the excellent students
- elite programs
- joint master programs with other universities

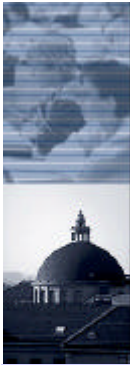
and:

introduction into management, finance, human
resource

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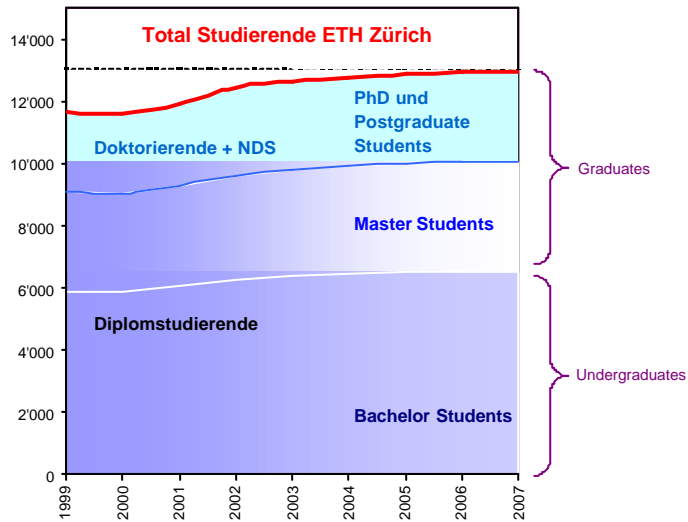
Students 1999 – 2007 (Projections)



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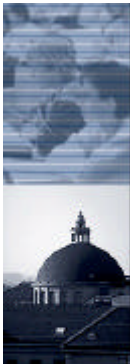
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- Higher Education in Switzerland
- ETH
- Innovating Teaching
 - Bologna Reform
 - **Quality**
 - New Teaching Technologies
 - Networking, Internationalization

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Quality: Teachers and Teaching



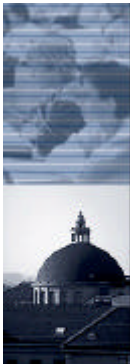
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- Teaching qualification at the moment of the hiring
- Evaluation by students, alumni, peers
- Benchmarking (SPINE Project)
- Center for teaching and learning

Quality: what should be evaluated?

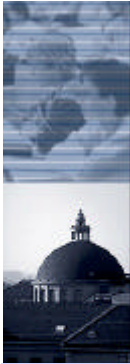


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- Teaching
- Curricula
- Labor market perspectives
 - Research: quality, productivity, relevance
- Internationalization
- Academic staff: qualifications, satisfaction
- Infrastructure, facilities
- Administration
- Hiring Process



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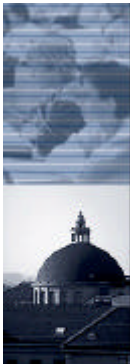
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Model *ETH*: Ground Rules

- clear emphasis on improvement function
- control function marginal
- different modules: consider combined picture
- define owners: who drives the process, who gets to see the results
- get those concerned involved
- results open to those with a vested interest

clearly define how results will be used: what are the consequences



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Model *ETH*: Modules

- Course evaluation by students
- Auto-evaluation of the yearly teaching performance
- Self-evaluation of department
- External assessment (peers and others)
- Assessment by alumni

Modules (continued)



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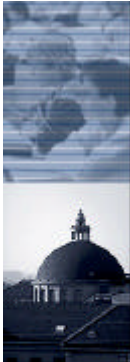
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- History of a diploma student
- Study times
- Statistics on perspectives on the job market
- Interviews with chief personnel officers in big companies (planned)
- Evaluation of infrastructure and administrative services

Course Evaluation by Students

4 - part questionnaire

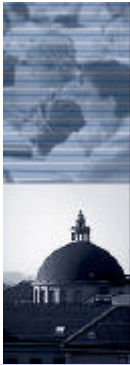


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- 3 Rector's questions
- Department's questions
- Lecturer's questions
- open questions

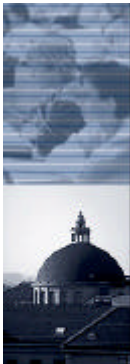


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- Rector's questions identical for the whole university
- Department's questions chosen by the departmental committee for teaching and learning (1/3 students, 1/3 teaching assistants, 1/3 faculty)
- Lecturer's questions: course dependent
- results determined neutrally, anonymously



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- Discussion of the results in class
- Results parts 3 and 4 remain with the lecturer
- Results parts 1 and 2 published in departmental internet, discussed in the committee for teaching and learning, recommendation to lecturer and department chair
- Analysis of answers to Rector's questions in rectors office, discussion with Department Chair, if necessary action

Course evaluation: experiences



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- Positive reactions by students and faculty
- significant results, localization of problem spots
- actions for improvement

- further insights

External Assessment



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- One department at the time
- External committee determined by school management (peers, leaders from industry, maybe from government), 8 - 10 members
- Same committee in Lausanne and in Zürich
- one full week, meetings with all members of the department, students, visits of premises



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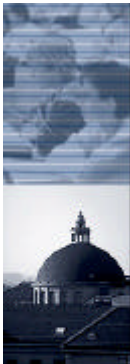
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External Assessment

- three meetings with school management
- oral debriefing behind closed doors
- written report with recommendations
- department gives a written opinion, proposes measures
- management decides measures

- lasting effect, high cost



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Assessment by Alumni

- Questionnaire to alumni 3, 4, 5 years after they left the school
 - questions about professional development, present job, position, salary
 - university education in retrospective
 - importance of particular fields
 - fields missing from curriculum
 - Importance of various aspects, contribution of ETH, (benchmarking with MIT)
-
- assessment of courses and lecturers

Assessment by Alumni (cont.)



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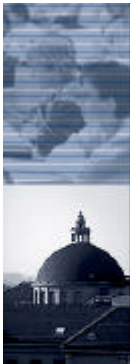
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■ Consequences

- new focussing of course offering
- revision of curricula
- action in case of important, but poorly taught courses

Analysis of study times

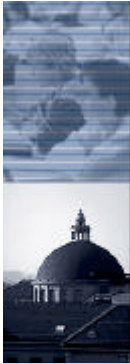


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- Time to diploma / doctorate;
theoretical versus actual values
- Dropouts
- Change of subject



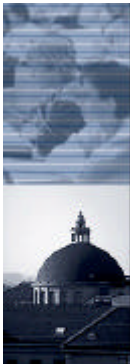
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Perspectives on the Job Market

- Finding a job
- Happiness with the job found
- Area of work: does it correspond to what you have studied at ETH



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Conclusions

- **Modules combined give a multifaceted picture of teaching, research and services at ETH**
- **only some of the results are truly helpful as tools for leadership**
- **Direct participation of everybody involved generates a positive, supporting attitude**
- **Initial fear and aversion disappeared**



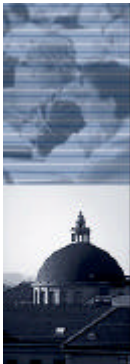
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Conclusions (cont.)

- **Flexibility:** adjust evaluation to the particular aspect under scrutiny, to the particular situation
- **Respect freedom of teaching and research**
- **protection of privacy**
- **there is no universal concept of what is good teaching**



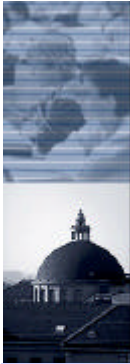
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Conclusions (cont.)

- High costs: personnel and financial
- **Example:** Auto-evaluation and Peer-review for the Department of Civil Engineering (22 senior faculty, 850 students):
- **54 man-months, 80'000 US\$**
- Danger of wear and tear



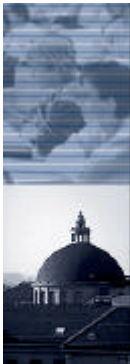
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Conclusions (cont.)

- **Evaluation has to be process oriented: who looks at what, for what purpose, by which means, with the help of whom**
- **Who draws when which conclusions**



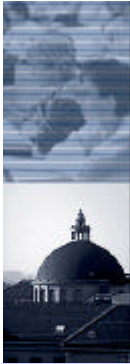
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Conclusions (cont.)

- used with moderation
- interpreted with modesty and caution
- with the willingness to draw conclusions and consequences
- **evaluation is an invaluable and unavoidable tool to further and to assure quality**

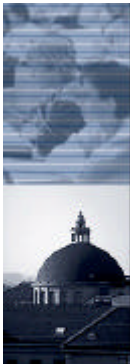


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- **Higher Education in Switzerland**
- **ETH**
- **Innovating Teaching**
 - Bologna Reform
 - Quality
 - **New Teaching Technologies**
 - Networking, Internationalization



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Who is teaching?

- **Major courses are taught by professors**
- **Teaching load between 4 -6 semester hours in 2 semesters of 14 weeks each**
- **Exercise sessions, lab courses etc. with the help of the doctoral students = assistants (they all get a salary of 2000€up)**
- **some auxiliary work is done by the master students**

Compulsory (in part) courses in teaching technologies for assistants

New teaching technologies



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- **Funding of Innovative Teaching Projects**
 - 2 - 4 Mio. € per Year
 - 50 Projects

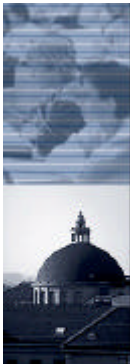
- **Support offered by *ETH Learning Center***
 - *NET* (Network for educational technologies)
 - *Center for didactics*
 - *ETH tools*
 - *Center for continuing education*

▪ Higher Education in Switzerland

▪ ETH

▪ Innovating Teaching

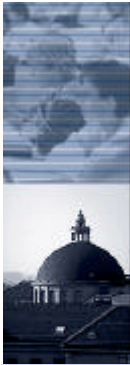
- Bologna Reform
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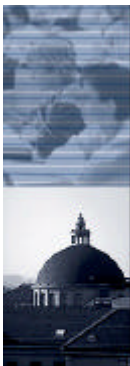
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National Co-operation ^{©KO} University Network Zurich

Examples

- **Free Access to all Courses of ETH and University of Zurich for all Students**
- **Joint Language Learning Center**
- **Joint Master Program in Microbiology (Starts Autumn 2002)**
- **Joint Master Program in Finance (Starts Autumn 2002)**
- **Coordinated Bachelor and Master Program in Chemistry**
- **Intensive Collaboration in Social Sciences and Humanities**



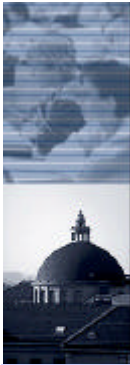
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National Co-operation ^{©KO} Other Examples

- **EPF Lausanne:**
 - Telepoly, continuing Education, etc.
- **University of Basel:**
 - Pharmaceutical Chemistry
- **Università della Svizzera Italiana:**
 - Building Construction, Energy Policy and Economics



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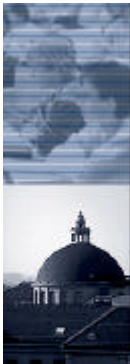
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International Co-operation ^{©KO} IDEA League

Imperial College, TU Delft, ETH Zurich, RWTH
Aachen

- A small and exclusive **Network** for
 - a close collaboration on **strategic policy issues**,
 - the **exchange of ideas** and expertise,
 - a shared notion of quality
 - **joint activities** (internationalisation of education, common research interests, human resource development etc.)
 - the use of **collective power** to attract more funding and to influence Europe's policy in research and education



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International Co-operation ^{©KO} IDEA League - Activities

- **Quality Assurance:** 9 common principles
- **Comparison of curricula** (input)
- Definition of **quality profiles** at Bachelor's and Master's level (outcome)
- **Recognition of degrees**
(undergraduates and graduates of the partner universities are treated as the own ones)



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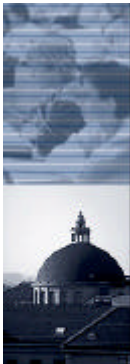
International Co-operation ^{©KO} UNITECH International: The Partners

Academic Partners

RWTH Aachen
 UPC Barcelona
 TU Delft
 Chalmers, Göteborg
 Imperial College
 London
 ParisTech /
 Ecole Polytechnique
 Politecnico di Milano
 ETH Zurich

Corporate Partners

ABB (Switzerland)	PSA Peugeot Citroën
DaimlerChrysler	Shell
Degussa	Siemens
Gruppo Falck	Unaxis
F. Hoffmann-La Roche	ZF Friedrichshafen
Hilti	usw.
IBM	
L'Oréal	
Mapei	
Philips	



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UNITECH International ^{©KO} Complementing academic excellence

Home University educates excellent **specialists**:

- solid base education
- excellent engineering background
- leading edge research

UNITECH trains students to be broader **generalists**:

- cross cultural experience
- language skills
- interpersonal skills
- understanding of management principles
- practical experience in industry



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ETH wants

- to finish the curricular reform by 2005
- to take a lead in Switzerland and in Europe
- to strengthen its student recruitment world-wide in collaboration with IDEA League partners
- to intensify collaboration with North America and with the far East
- To build up and to strengthen collaboration in research and in education particularly with institutions in southern and in eastern Europe, in south America and in India

Major problems to be solved

- Financial aspects
- Immigration laws, recognition of degrees

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