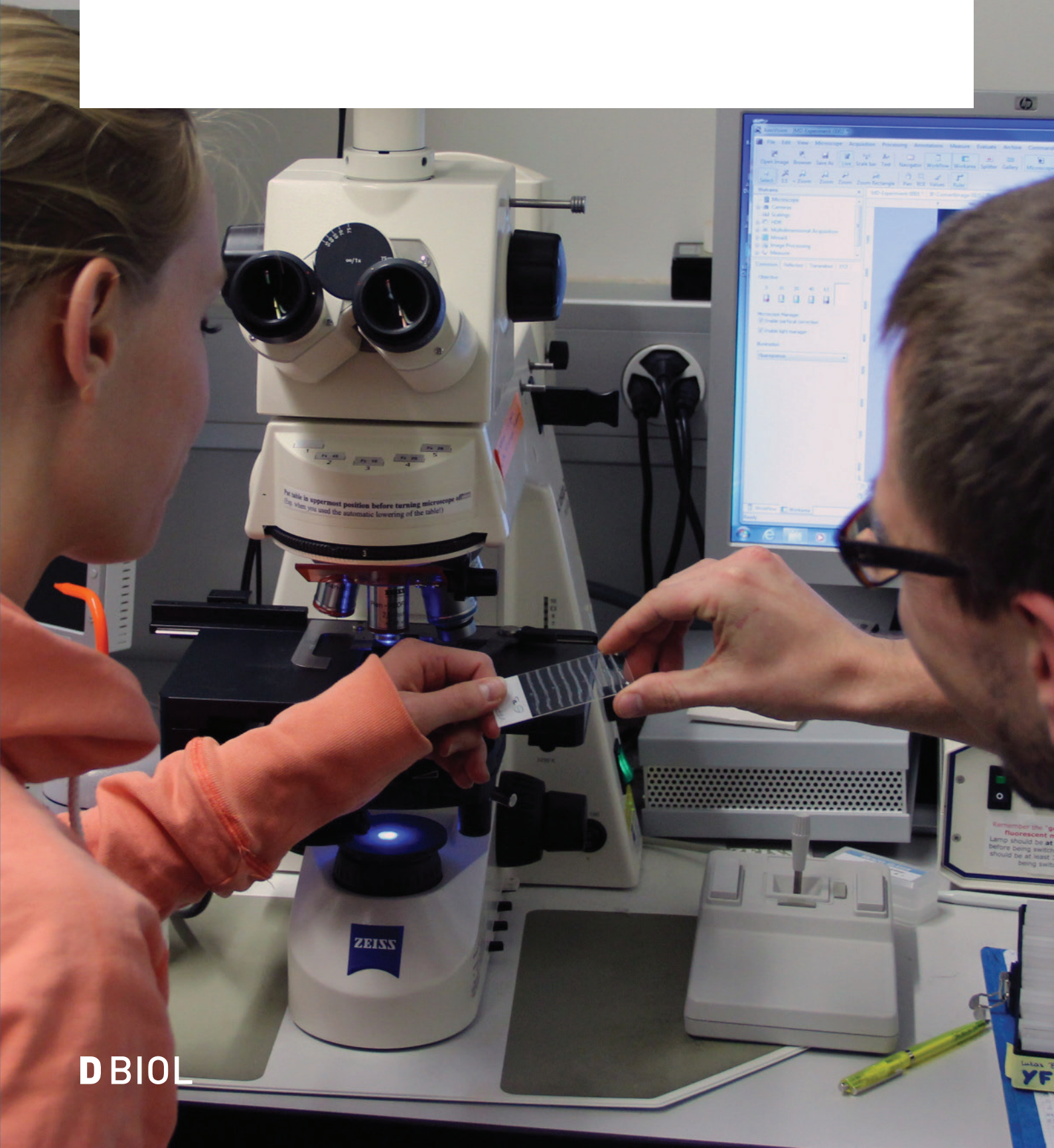


Master in Biology

Study guidelines for the year 2015/16

Programme regulations 2006



Master Programme in Biology

Table of contents

1.	INTRODUCTION	2
2.	ADMISSION	2
3.	CREDIT POINTS SYSTEM	3
4.	COURSE CATALOGUE	4
5.	PERFORMANCE ASSESSMENTS	4
6.	LEARNING AGREEMENT.....	4
7.	STUDY PROGRAMME	4
	COMPULSORY COURSES AND ELECTIVE COMPULSORY COURSES	5
	RESEARCH PROJECTS	7
	MASTER THESIS	8
	MASTER EXAMINATION.....	9
8.	ELECTIVE MAJORS	10
	ECOLOGY AND EVOLUTION.....	10
	NEUROSCIENCES	11
	MICROBIOLOGY AND IMMUNOLOGY	12
	CELL BIOLOGY	13
	MOLECULAR HEALTH SCIENCES	14
	BIOCHEMISTRY.....	15
	PLANT BIOLOGY	16
	SYSTEMS BIOLOGY.....	17
	STRUCTURAL BIOLOGY AND BIOPHYSICS.....	18
	BIOLOGICAL CHEMISTRY	19
9.	EXCHANGE PROGRAMME	20
10.	REQUEST FOR DEGREE CONFERRAL	20
11.	„LEHRDIPLOM IN BIOLOGIE“	20
12.	FAST TRACK PHD.....	21
13.	DOCUMENTATION	23
14.	CONTACT INFORMATION.....	24

1. Introduction

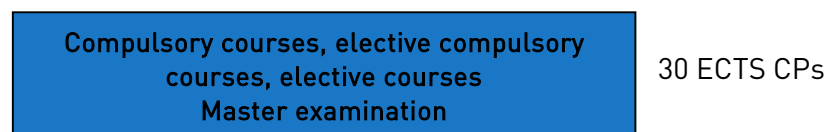
The biology Master programme is of one and a half years duration and is focused on experimental approaches, including two research projects and a thesis. Depending on the candidate's previous training, additional 3rd year courses from the Bachelor programme may have to be taken. Otherwise there is a choice from a list of specific master courses in each of the elective MSc majors. Successful completion of the master programme will allow graduates to pursue doctoral studies in national and international research institutions, or to apply for positions in industry or the public service sector.

The legal basis for this study guide is the ETH document entitled "Studienreglement 2006 für den Master Studiengang Biologie" (available only in German). Please see <http://www.biol.ethz.ch/studium/master/wegleitungen-und-reglemente.html>.

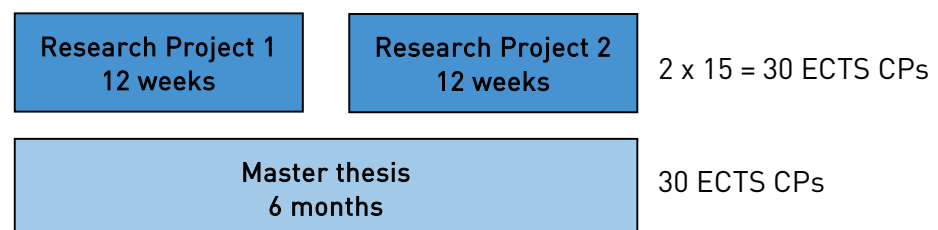
Programme overview

(90 ECTS credit points in 1.5 years)

Theoretical part



Practical part



2. Admission

As a rule, admission to the programme requires a Bachelor degree in biology or biochemistry from a recognized university.

ETH students enrolled in the Bachelor programme in Biology

Students must have earned all CPs of the first two years of the Bachelor programme before enrolling for the Master programme.

Students of the University of Zurich

Students holding the Bachelor degree in Biology or Biochemistry of the University of Zurich are admitted to the ETH Master programme in biology without additional requirements, except for documentation of a good knowledge of the English language is also required.

Students from other universities

Students from other universities must hold a Bachelor or equivalent degree in a field of biology, biochemistry or related areas from a recognized university. Documentation of a good knowledge of the English language is also required. Final admission may be subject to the fulfilment of additional requirements (e.g. courses from the ETH Bachelor biology programme).

Application procedure

ETH students in the Bachelor programme in Biology

Students who have earned the required amount of credit points may register for the Master programme online at <https://www.lehrbetrieb.ethz.ch/myStudies/>

Other students

Information about admission for other students can be found at <https://www.ethz.ch/en/studies/registration-application/master.html>

Note: It is essential that applicants indicate which of the Master majors (see below) they intend to apply for.

Online application for Master programmes:

<https://www.lehrbetrieb.ethz.ch/eApply/ealoglein.view?lang=en>

3. Credit points system

Credit points are awarded according to the European Credit Transfer System (ECTS). Credit points (CPs) are a measure of the total time and effort required by a student to reach a given educational goal. The calculation is based on a total of 1500 to 1800 working hours per year, for 60 credit points (1 CP corresponds to 25 to 30 hours of work).

4. Course catalogue

The actual list of courses, including schedules, short descriptions, information about contents and goals, lecturers, credit points, and performance assessment procedures is published in the electronic course catalogue at www.vz.ethz.ch (for the English version, click on the “en” button on the right upper corner of this webpage).

5. Performance assessments

Credit points are awarded only for successfully completed performance assessments. An assessment that has not been passed may be repeated once only. Assessments are in the form of examinations, presentations, reports, etc..

Grading scale: 6 is the highest, 1 is the lowest grade; passmark is 4.

An assessment may take place during the semester, at the end of a semester, or during the ETH examination session. For each course, the assessment method is indicated in the electronic course catalogue.

For session examinations and end of semester examinations additionally to a course enrolment in myStudies, a registration is mandatory. This registration is binding and an absence without excuse will result in failing the assessment. The time schedule for registration and deregistration is communicated by the examinations office of the rectorate.

6. Learning agreement

After admission to the Master programme, students define their individual study programme (= Learning Agreement) together with the advisor of the chosen major. In the case of any disagreement, the director of studies will make the final decision regarding the study programme. Any changes to the study programme must be approved by the study advisor. The Learning Agreement has to be filled in here: <https://la.biol.ethz.ch> (ETH-login required).

7. Study programme

The programme is designed to be completed by full-time students in 1.5 years. To obtain the Master degree, a minimum of 90 credit points in different categories according to the following list must be acquired within a maximum of three years.

Minimum number of credit points required per category

Category	Credit points
Theoretical part	
Compulsory, elective compulsory* and elective courses	24
Elective courses in humanities, social and political sciences (GESS)	2
Master examination	4
Practical part	
Two research projects	30
Master thesis	30
Total	90

*A minimum of 18 credit points must be obtained from compulsory and elective compulsory courses.

Compulsory Courses and Elective Compulsory Courses

Concept courses

As a rule, two concept courses (lectures from the third year BSc Biology at ETH Zurich, 6 CP each) are compulsory for all majors. Some majors require two courses, and others only one. For the latter case, the second concept course has to be chosen as indicated in the table below. If the credit points for the required concept courses have already been obtained in the Bachelor programme, then the students should replace the 6 or 12 CP using master courses of the category "elective compulsory master courses". Concept courses may be listed as elective "free choice" courses if they are not part of the list of elective compulsory concept courses (see below). Please note that all courses must be approved by the study advisor.

A maximum of 12 CP of concept courses can be applied toward the degree. Note that any concept courses required for admission (prerequisite course) do not earn credit points towards the degree.

Compulsory and elective compulsory concept courses in the individual Master majors

(Bold letters: compulsory concept courses; plain letters: elective compulsory concept courses)

Master major	1 st concept course	2 nd concept course
Ecology and Evolution	Evolutionary Genetics Autumn semester	Pflanzenökologie/Advanced Ecological Processes Autumn/spring semester
Neurosciences	Neurobiology Autumn semester	Cell Biology <i>or</i> Concepts in Modern Genetics <i>or</i> Cellular Biochemistry <i>or</i> Immunology

Study programme

Master major	1 st concept course	2 nd concept course
Microbiology and Immunology	Microbiology Autumn/spring semester	Immunology Autumn/spring semester
Cell Biology	Cell Biology Spring semester	Concepts in Modern Genetics <i>or</i> Cellular Biochemistry <i>or</i> Neurobiology <i>or</i> Introduction to Bioinformatics: Concepts and Application <i>or</i> Immunology <i>or</i> Systems Biology <i>or</i> Molecular Disease Mechanisms I <i>or</i> II
Molecular Health Sciences	Molecular Disease Mechanisms I Autumn Semester	Molecular Disease Mechanisms II <i>or</i> Cell Biology Spring Semester
Biochemistry	Cellular Biochemistry Autumn/spring semester	Cell Biology <i>or</i> Biomolecular Structure and Mechanism <i>or</i> Concepts in Modern Genetics
Plant Biology	Molecular Life of Plants Autumn semester	One additional concept course except Neurobiology <i>and</i> Immunology <i>and</i> Molecular Disease Mechanisms I <i>and</i> II
Systems Biology	Systems Biology Spring semester	Concepts in Modern Genetics <i>or</i> Cellular Biochemistry <i>or</i> Microbiology <i>or</i> Introduction to Bioinformatics: Concepts and Application
Structural Biology and Biophysics	Biomolecular Structure and Mechanism I/II (Protein Structure and Function/Large Cellular Machines) Autumn/spring semester	Cellular Biochemistry <i>or</i> Proteins and Lipids <i>or</i> Nucleic Acids and Carbohydrates <i>or</i> Microbiology <i>or</i> Introduction to Bioinformatics <i>or</i> Concepts in Modern Genetics <i>or</i> Systems Biology
Biological Chemistry	Nucleic Acids and Carbohydrates Autumn semester	Proteins and Lipids <i>or</i> Biological Chemistry - Peptides

Master courses

The master courses may be chosen from the list published in the course catalogue for every major (www.vvz.ethz.ch).

Elective courses

These courses allow students to expand their knowledge in areas related to their elective major. They may be chosen from other majors or other MSc programmes from ETH. As a rule only courses from Master level may be chosen. In the case a concept course is selected, only fully completed concept courses (6 CPs) will be accepted in this category. Approval of the respective study advisor is required.

Elective courses in humanities, social and political sciences (GESS)

All students must gain credit points for courses offered by the ETH Department of Humanities, Social and Political Sciences.

Research projects

General

In the Master programme two research projects have to be performed. The students should acquire the projects by themselves. If necessary, the study advisor can give guidance. For each research project students need to have the consent of the study advisor and the research projects have to be listed in the learning agreement. The duration of a research project is 12 weeks (based on a 40 hours week). The projects are not bound to the academic calendar. If lectures are attended in parallel, the research project is extended by the respective time. Research projects can be performed outside ETH Zurich or University of Zurich. In this case the Master thesis must be performed at ETH Zurich or University of Zurich. **(Exception: students with a non-ETH BSc must perform both projects at ETH or the University of Zurich.)**

Aim

The two individual research projects provide insights into the research processes in the area of the chosen major. The projects should prime the students for the Master thesis.

Signature form for research projects and Master thesis

Before starting a research project the signature form (<https://www.biol.ethz.ch/content/dam/ethz/special-interest/biol/departement/Signatureform.pdf>) has to be signed first by the supervisor of the research project, second by the major advisor. Any research project started without signature of the major advisor will be considered invalid and will be recorded as “no show” in the transcript of records.

Report

Each research project has to be completed with a written report, within 12 weeks after begin resp. at the date arranged with the supervisor. The report must be in paper format (title, summary, introduction, results, discussion, materials and methods, references). As a rule the report should comprise five to ten pages.

In any case the report has to be finished, assessed and the CPs have to be officially granted before the start of the Master thesis.

Assessment

The supervisor evaluates the written report and grades it as passed or not passed (for a passed research project 15 CPs are granted). The supervisor is bound to have a final discussion with the student about the research project.

Master thesis

Admission

Before starting the Master thesis the signature form (<https://www.biol.ethz.ch/content/dam/ethz/special-interest/biol/department/Signatureform.pdf>) has to be signed first by the referee and co-referee.

Second, the student has to show the form to the student administration office (the office will check a) if the student has been awarded the Bachelor degree, b) if any additional requirements for admission to the Master programme have been fulfilled and c) if both research projects have been passed). If all requirements are fulfilled the administration office will sign the form.

The form has to be shown to the major advisor which then gives the final approval.

Any Master thesis started without signature of the major advisor will be considered invalid and will be recorded as “no show” in the transcript of records.

Aim

For the Master thesis (duration: 6 months, 30 CP), a student should demonstrate the ability to conduct independent research and to provide a written scientific report of that work and its results.

Referee, co-referee and starting date for the thesis

The Master thesis is performed under the supervision of an entitled lecturer (= referee). Additionally a co-referee has to be specified. The referee and the co-referee grade the thesis. Before a student starts a Master thesis, a referee, a co-referee and the intended starting date for the thesis must be defined in the Learning Agreement. The thesis has to be approved by the study advisor before its start.

The list of lecturers entitled to supervise and evaluate Master theses is available at <http://www.biol.ethz.ch/en/studies/master/master-thesis.html>

Master thesis submission

The Master thesis (i.e. the **uncorrected thesis document that is considered by the student to be the final version**) has to be submitted by the agreed date (cf. Learning Agreement) in hardcopy to the referee and the co-referee and as pdf-document by email to the student administration office (studies@biol.ethz.ch). The format should not exceed A4. The front page should enlist:

- name of the student
- title
- where the thesis was performed
- supervisor
- referee and co-referee
- date of submission

The Master thesis must comprise a declaration of originality (<https://www.ethz.ch/content/dam/ethz/main/education/rechtliches-abschluesse/leistungskontrollen/declaration-originality.pdf>).

The Master thesis is graded according to the “Master Thesis Evaluation Form” (<http://www.biol.ethz.ch/en/studies/master/master-thesis.html>). All Master theses are archived in the Department of Biology’s student administration office for two years.

Master examination

In the Master examination a student must provide proof of general knowledge in the elective major field on the basis of the Master thesis. Starting with a discussion based on the Master thesis further experiments and experimental strategies should be discussed in order to test the general understanding in the chosen major. As a rule the discussion of the Master thesis must not exceed 50% of the examination time. The exam is taken as an oral examination lasting 60 minutes. The exam must be taken within 3 months after submission of the Master thesis. As a rule, the examiners are the referee and the co-referee of the thesis. If necessary, a third, approved examiner may be called.

8. Elective majors

The Department of Biology offers ten different Master majors, ranging from Ecology and Evolution to Biological Chemistry and thus covering all the important fields of modern Biology.

Ecology and Evolution

The Master programme in Ecology and Evolution focuses on the diversity of organisms and the interactions between organisms and their environment. Evolutionary aspects - at the level of populations, communities and ecosystems - are emphasized, because species composition is determined by natural selection. Work in the field is accompanied by investigations in experimental gardens, greenhouses, and laboratories. Modern molecular research approaches provide insights into the genetic basis of natural selection, also theoretical models and computer simulations may allow predictions for future developments.

Those interested in this programme are advised to also consult the description of the MSc major "Ecology and Evolution" in Environmental Sciences at www.usys.ethz.ch/env/master/major/3/index_EN, which offers a module in "Applied Ecology" in addition to the modules "Principles in Ecology and Evolution" and "Species, Communities and Ecosystems".

The successful completion of the Master programme in Ecology and Evolution prepares the student for a professional career in scientific research areas concerned with questions about organismal biology. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides Master graduates with a scientific profile suitable for competitive positions in the fields of ecological assessment and conservation biology.

Advisor

Prof. Gregory Velicer
ETH Zurich
Professur für Evolutionsbiologie
CHN K 11
Universitätsstrasse 16
8092 Zürich

Tel.: +41 44 632 88 00
E-mail: gregory.velicer@env.ethz.ch

Neurosciences

Neurosciences focus on the development, anatomy, plasticity and diseases of the nervous system, the functions of simple and complex neuronal networks, processes like memory, emotions, addiction or behavior in animal models and humans. Computational neuroscience and neuroinformatics develop predictive theories based on experimental data of how neurons work, how brains build themselves, and how complex networks function in perception, cognition, action, and in disease. These models are also used to implement key principles of brain structure and function in artificial technology.

Master students in Neuroscience receive a broad training which makes them familiar with conceptual and methodological approaches from the cellular and molecular level to the whole organism. Within the Neuroscience Center Zurich (ZNZ, www.neuroscience.uzh.ch) scientists from both the ETH Zürich and the University of Zürich, as well as the University Hospital, cover this field on all levels, from basic molecular and cell biology to complex circuit analysis, model building, behavioral biology and human studies.

The successful completion of the Master program in Neurosciences prepares the student for a professional career in scientific research areas concerned with the function of the central nervous system. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in the fields of biomedical, pharmaceutical, computer or microelectronic industry, respectively.

Advisor

Prof. Martin Schwab
ETH Zurich
Professur für Neurowissenschaften
Y 55 H 52
Winterthurerstrasse 190
8057 Zürich

Tel.: +41 44 635 33 30
E-mail: schwabm@ethz.ch

Microbiology and Immunology

Microbiology deals with microorganisms, a large and very heterogeneous group of usually microscopically small prokaryotic and eukaryotic organisms, *i.e.* bacteria and archaea, protozoa, algae and fungi, but also viruses. Microbes are characterized by a high metabolic diversity allowing them to explore a wide variety of habitats. As pathogens and commensals, they are of central medical importance and represent the major target of our immune system.

Immunology centers on the questions how such pathogens are recognized and how they are eliminated from the organism. Microorganisms play an important role in food processing and they are used in many different biotechnological processes, being it for the production of pharmaceuticals or chemical substances. This elective major offers courses and research opportunities in the areas of microbial cell biology, medical microbiology, virology, immunology, food microbiology, microbial ecology, plant pathology, mycology, parasitology, etc.

The successful completion of the Master programme in Microbiology and Immunology prepares the student for a professional career in scientific research areas concerned with microorganisms and their impact on other organisms, including humans. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in the fields of biomedicine and biotechnology, as well as in health organizations.

Advisor

Prof. Julia Vorholt
ETH Zurich
Institute of Microbiology
HCI F 429
Vladimir-Prelog-Weg 1-5/10
8093 Zürich

Tel.: +41 44 632 55 24

E-mail: julia.vorholt@micro.biol.ethz.ch

Cell Biology

The Master programme in Cell Biology focuses on an understanding of fundamental life processes in higher organisms, from cell growth, cell differentiation and cell-cell communication to hormonal, inflammatory and neuronal signaling. These processes are studied in the context of cells, individual tissues and complex organisms, thereby expanding the horizons of cell biology to molecular physiology. Emphasis is also put on understanding the function of biological macromolecules and interaction networks associated with diseases such as cancer, diabetes and brain disorders. The experimental and conceptual approaches include modern cell biological, (bio)chemical and genetic methods combined with modern molecular imaging techniques, and morphological and physiological technologies.

The successful completion of the Master programme in Cell Biology prepares the student for a professional career in scientific research areas concerned with biological questions on the cellular and organismal level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in the biomedical and pharmaceutical industry, clinical research laboratories, and health organizations.

Advisor

Dr. Andrea Kyburz
ETH Zurich
Institute of Molecular Health Sciences
HPL E 24.2
Otto-Stern-Weg 7
8093 Zürich

Tel.: +41 44 633 31 97

E-Mail: andrea.kyburz@biol.ethz.ch

Molecular Health Sciences

Residing at the interface of biosciences, medicine and technology, Molecular Health Sciences focuses on the study of the molecular basis of tissue and organ functions and their responses to stress, diet, environmental challenges and aging and the illumination of organ-organ communication principles, stem cell function and inter- and intracellular signaling networks. Particular emphasis is given to integrating the knowledge derived from these studies into the context of whole body function to advance understanding of common complex diseases such as diabetes, obesity, heart disease, cancer, neurological and inflammatory disorders. The development of the scientific basis for rational preventive and therapeutic strategies for the successful management of human diseases is another core component of the program. Participants of the program will acquire the experimental skills to apply tools and insights from many disciplines ranging from genetics and genomics and molecular cell biology and physiology to biological chemistry, in vivo imaging and molecular pathology to address unsolved problems in basic and translational sciences.

The successful completion of the Major in Molecular Health Sciences prepares the student for a career in biomedical research areas and pharmaceutical sciences. This education provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also a scientific profile suitable for competitive positions in the fields of biomedicine, biotechnology, health technologies and health organizations.

This program is offered as part of a collaboration in teaching between D-BIOL and D-HEST in the context of the MSc in Biology and MSc in Health Sciences and Technology curricula (<http://www.biol.ethz.ch/en/studies/master.html> and <http://www.hest.ethz.ch/en/studies/health-sciences-and-technology.html>).

Advisor

Dr. Andrea Kyburz
ETH Zurich
Institute of Molecular Health Sciences
HPL E 24.2
Otto-Stern-Weg 7
8093 Zürich

Tel.: +41 44 633 31 97
E-Mail: andrea.kyburz@biol.ethz.ch

Biochemistry

The Master programme in Biochemistry aims at the development of advanced, research-oriented theoretical and practical skills in cellular biochemistry, and communicative, interdisciplinary attitude. The training focuses on the molecular mechanisms and concepts underlying the biochemistry of cellular physiology, and associated pathologies such as cancer. We put particular emphasis on the question of how these processes are integrated to carry out complex, highly coordinated cellular functions. The investigation and understanding of processes such as intracellular transport, cytoskeletal regulation, cell polarity, cell motility, cell division and cell growth requires a combination of approaches like classical biochemistry and molecular biology, but also cell biology, genetics, live cell imaging and quantitative data analysis.

The successful completion of the Master programme in Biochemistry prepares the student for a professional career in scientific research areas concerned with biological questions on the molecular and cellular level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in biotechnology, clinical chemistry, and the chemical, biomedical and pharmaceutical industry.

Advisor

Dr. Alicia Smith
ETH Zurich
Institute of Biochemistry
HPM G 6.2
Otto-Stern-Weg 3
8093 Zürich

Tel.: +41 44 632 31 37

E-mail: alicia.smith@bc.biol.ethz.ch

Plant Biology

The Master programme in Plant Biology emphasizes the fundamental understanding of plants from the molecular genetic to the organismal level. In particular, students will experience, both in theory and in their experimental work, how the interconnected networks of genes and gene products work together in steering processes in plants, e.g. during development or under specific environmental conditions. Apart from plant biology, students are encouraged to broaden their educational skills in areas such as cell and structural biology, genetics, microbiology and plant protection, systems biology and metabolism. In plant biotechnology students learn how their knowledge can contribute to crop improvement. As members of the Zurich-Basel Plant Science Center (PSC, www.plantscience.ethz.ch), ETH Master students also benefit from joint PSC courses and courses given at the other two universities.

The successful completion of the Master programme in Plant Biology prepares the student for a professional career in scientific research areas concerned with plant-related questions on the molecular, cellular and systems level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in biotechnology, agriculture, and the agrochemical and biomedical industry.

Advisor

Prof. Wilhelm Gruissem
ETH Zurich
Institute of Plant Sciences
LFW E 56.1
Universitätsstrasse 2
8092 Zürich

Tel.: +41 44 632 08 57

E-mail: wilhelm.gruissem@ipw.biol.ethz.ch

Systems Biology

Systems biology targets networks, cells, organs and complete organisms by integrating experimental data with computational and theoretical approaches. It thus combines concepts from different scientific disciplines to obtain a quantitative understanding of complex biological systems in terms of their components and interactions. Experimentally, the focus is on development and application of novel quantitative methods for global analysis of cellular components (e. g. the proteome or metabolome) and their manipulation, for example through small interference (si) RNA screens. Computationally, the focus is on developing bioinformatics methods for data analysis and mathematical models for in silico experiments. Model-based integration of large and heterogeneous data sets opens new perspectives for deeper insights into human disease as well as development of new therapies and novel biotechnological processes. This interdisciplinary major is designed for biologists, bioinformaticians and computer scientists and promotes interdisciplinary communication skills. Depending on interest and capabilities, a focus on theoretical or experimental aspects will be encouraged.

The successful completion of the Master programme in Systems Biology prepares the student for a professional career in scientific research areas concerned with biological questions on the cellular, organismal, bioanalytical and computational level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training. In addition, it provides a solid background on the modern work flows in industry, and the scientific profile desired for competitive positions in biotechnology, biomedical and pharmaceutical industry.

Advisor

Dr. Nicola Zamboni
ETH Zurich
Institute of Molecular Systems Biology
HPT D 78
Auguste-Piccard-Hof 1
8093 Zürich

Tel.: +41 44 633 31 41
E-mail: zamboni@imsb.biol.ethz.ch

Structural Biology and Biophysics

The Master programme in Structural Biology and Biophysics focuses on the structural, chemical and physical principles underlying the function of biological macromolecules and supramolecular assemblies. The programme includes courses on the three-dimensional structure determination of proteins and nucleic acids at atomic resolution with X-ray crystallography and nuclear magnetic resonance (NMR) spectroscopy. In addition, it offers courses on biophysical methods that can be applied to unravel the mechanisms of biological macromolecules towards a quantitative description of biomolecular reactions, including reaction kinetics, modern techniques in fluorescence and single-molecule spectroscopy, electron microscopy, and general biophysical methods such as analytical ultracentrifugation and thermodynamics.

Participants of the programme will acquire experimental skills in the production and purification of recombinant proteins, the biophysical characterization of the interactions between biological macromolecules and their ligands, three-dimensional structure determination and quantitative analysis of reaction mechanisms on the molecular level.

The successful completion of the Master programme in Structural Biology prepares the student for a professional career in scientific research areas concerned with biological questions on the molecular level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in biotechnology and the chemical, biomedical and pharmaceutical industry.

Advisor

Prof. Eilika Weber-Ban
ETH Zurich
Institute of Molecular Biology and Biophysics
HPK E 19
Otto-Stern-Weg 5
8093 Zürich

Tel.: +41 44 633 36 78
E-mail: eilika.weber@mol.biol.ethz.ch

Biological Chemistry

Drawing a clear boundary between chemistry and biology is nearly impossible today given explosive growth of technologies for synthesizing large organic molecules such as proteins, nucleic acids, and complex carbohydrates. In the future, scientists investigating the foundation and processes of life will increasingly have to master chemical methods, including organic synthesis, NMR, and chromatography, and biological techniques such as growing bacteria, gene cloning, monoclonal antibody technology, and enzymology, to create molecules needed to test their biochemical hypotheses. A specialization in Biological Chemistry offers a biologically oriented alternative to studies in the Department of Chemistry and Applied Biosciences (D-CHAB). Its chief aims are to understand the chemical reactivity of biological molecules in living organisms and to learn to recognize and solve current problems in biomolecular design, engineering, and analysis. Students will acquire experimental skills toward synthesis, purification, and characterization of molecules ranging in nature and size from the very small (medicines and enzyme inhibitors) to extremely large (genes and proteins).

The successful completion of the Master programme in Biological Chemistry prepares the student for a professional career in scientific research areas concerned with biological questions on the molecular level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in biotechnology and the chemical, biomedical and pharmaceutical industry.

Advisor

Prof. Peter Kast
ETH Zurich
Laboratory of Organic Chemistry
HCI F 333
Vladimir-Prelog-Weg 1-5/10
8093 Zürich

Tel.: +41 44 632 29 08
E-mail: kast@org.chem.ethz.ch

9. Exchange programme

Students with a good academic performance may spend one or more semesters during their Master programme at another university. Students with a non-ETH Bachelor degree can only perform their Master thesis abroad. A study programme for the external university has to be confirmed by the advisor for the given major. A maximum of 30 CP may be acquired at another university.

Further information concerning the university exchange programmes is available at <https://www.ethz.ch/en/the-eth-zurich/organisation/infrastructure-divisions/rectorate/student-exchange-office.html>.

10. Request for degree conferral

Students may apply for the Master degree (request for the Master degree certificate via www.mystudies.ethz.ch) after having obtained the minimal number of credit points allocated to each category described in chapter 5. The printed and signed request for the degree certificate must be submitted to the student administration office. The learning agreement has to be completely filled in and approved. Paper versions have to be handed in. The degree certificates are issued once a month and sent directly to the alumni. It contains an academic record in German and a certified copy in English. Furthermore it contains a diploma supplement describing the content of the programme (including a list of all courses) and a ranking.

The overall mark for the Master degree comprises:

- Courses and Master examination, weighted according to ECTS points 50%
- Master thesis 50%

The official academic title awarded is

In German: “**Master of Science ETH in Biologie**”, abbr. MSc ETH Biologie

In English: “**Master of Science ETH in Biology**”, abbr. MSc ETH Biology

11. „Lehrdiplom in Biologie“

Details concerning the programmes in educational sciences (held in German) are found at <https://www.ethz.ch/content/main/de/studium/didaktische-ausbildung.html/>.

If you are enrolled in the “Lehrdiplom in Biologie” programme maximally 6 credits of the following courses are eligible for the elective courses:

- “Anatomie I + Physiologie I” (376-0151-00L)
- “Anatomie II, Physiologie II and Histologie” (376-0150-00L; for those who started before the autumn semester 2012)
- “Anatomie II und Physiologie II” (376-0152-00L; for those who started in the autumn semester 2012 or later)

The combination of courses that has to be taken in Anatomy and Physiology is defined in the student specific admission decree of the rectorate under additional requirements including examination modus (year course or semester course).

The specialized biology course with an educational focus (551-0963-00L, 12 CP) can be acknowledged as one of the two obligatory research projects (each 15 CP). In such a case, additional 3 CP must be obtained in another course.

The respective study advisor’s approval is required for both of the above cases.

12. Fast Track PhD

This programme allows excellent students to begin doctoral studies after one year of Master studies.

Conditions for admission

- those who started the Master studies at ETH Zurich and during the first year obtained excellent evaluation results (as a rule marks must be in the best 10%)
- all credit points, except those for the Master thesis and Master examination, (ie. 56 CP) must have been gained within the first year of the Master studies
- the doctoral-studies assessment examination (see below) must have been passed

Application

There is one deadline per semester for the submission of application (see link below). An application must be sent to the biology student administration office by the given deadline and be accompanied by the following documents:

- a copy of the Bachelor degree awarded to the candidate
- documented proof that any additional admission requirements (especially concerns ETH-external students) have been fulfilled
- a written confirmation from an authorised PhD supervisor that he or she will supervise and provide the necessary funding for the candidate’s doctoral studies
- a written outline of the planned project

Assessment examination

An eligible candidate will be required to undergo an oral assessment examination of at least 60 minutes duration and will be graded as having either passed or failed. In the case of failure, a repetition of this examination will not be allowed.

The examination comprises:

- a talk about the planned doctoral research project
- questions concerning the content of the planned project
- general questions about matters concerning the candidate's chosen Master major

After a successful assessment, a candidate may provisionally register for doctoral studies (more information at <http://www.biol.ethz.ch/en/studies/master/fast-track-zum-doktorat.html>).

MSc graduation and registration for the doctoral studies program

Eleven months after a provisional registration for doctoral studies is submitted, a candidate must submit an interim report on the results already obtained to the supervisor and a co referee. This report will be evaluated and marked as the Master thesis. A second copy must be handed in by the student to the Department of Biology's student administration office.

The Master examination must take place within 30 days after submission of the Master thesis.

The doctoral research proposal must be submitted separately within 12 months of the provisional doctoral studies registration (see <http://www.biol.ethz.ch/en/doctoral-studies/research-proposal.html>).

After Master graduation and approval of the doctoral research proposal by the D-BIOL doctoral studies panel, a candidate may be definitively admitted to the doctoral studies program.

13. Documentation

The Master studies programme regulations for biology are available at <http://www.biol.ethz.ch/en/studies/master/guidelines-and-regulations.html>.

The general regulations on evaluation assessment procedures at ETH Zurich (German version only, entitled „ Verordnung der ETH Zürich über Lerneinheiten und Leistungskontrollen an der ETH Zürich “) are available at <https://www.share.ethz.ch/sites/rechtssammlung/default.aspx>.

14. Contact information

Study administration office Biology Muriel Büttel D-BIOL HIT F41.2 Wolfgang-Pauli-Str. 27 8093 Zurich Tel.: +41 44 632 59 42 Fax: +41 44 632 14 52 E-mail: studies@biol.ethz.ch	Studies coordinator Dr. Thomas Tschan D-BIOL HIT F41.3 Wolfgang-Pauli-Str. 27 8093 Zurich Tel.: +41 44 632 36 67 E-mail: tschan@biol.ethz.ch
Director of studies Prof. Yves Barral Institute for Biochemistry HPM D8.3 Otto-Stern-Weg 3 8093 Zurich Tel.: +41 44 632 06 78 E-mail: yves.barral@bc.biol.ethz.ch	Educational developer Mario Bold D-BIOL HIT F 41.5 Wolfgang-Pauli-Str. 27 8093 Zürich Tel.: +41 44 633 37 11 E-mail: mario.bold@biol.ethz.ch

Names and contact details of the study advisors for each of the Master majors are listed in chapter 8.

Military advisory service and coordination of civil and military education

Prof. Dr. Markus Aebi, ETH Zürich, Institut für Mikrobiologie, HCI F 407,
Vladimir-Prelog-Weg 1-5/10, 8093 Zürich
Tel.: +41 44 632 64 13, E-Mail: aebi@micro.biol.ethz.ch

Rectorate

HG F 19, Rämistrasse 101, 8092 Zürich

Opening hours: Mo – Fr, 11:00 – 13:00

ETH card, registration, semester fees, study confirmations, leaves, etc.

<https://www.ethz.ch/en/the-eth-zurich/organisation/infrastructure-divisions/rectorate.html>

Kontakt

ETH Zürich
Departement Biologie
HIT F 41
Wolfgang-Pauli-Strasse 27
8093 Zürich

www.biol.ethz.ch