ETH zürich

Department of Biosystems Science and Engineering

D BSSE

Department of Biosystems Science and Engineering

From the Theory of Biosystems to Understanding and Engineering Cells and Organisms

Research in life sciences is central to overcoming the challenges of human health and disease, production processes in industry and their impact on the environment. The magnitude and complexity of these challenges call for a paradigm shift towards holistic, systems-based and interdisciplinary approaches.

At the Department of Biosystems Science and Engineering (D-BSSE), experimental and computational biologists and engineers work together in an interdisciplinary team in order to conduct comprehensive analysis of complex processes in cells and organisms. They develop strategies and techniques for the programming and rational design of cell functions, and implement these in complex biological systems. D-BSSE research is driven by open scientific questions and unmet societal needs in biotechnology and life sciences.

19 spin-off companies since 2007

123 current grants

23 ERC grants (incl. two SNSF replacement grants)

23 professors

1 professor of practice from industry

180 Master's students

360 total staff from over 40 countries, including:

180 doctoral student

110 postdocs/permanent scientific staff

17.4 million CHF third party funds in 2024

Collaborations

60 University of Basel

23 University Hospitals

12 other research institutes

Basel area

214 institutions outside Switzerland

136 ETH Zurich

50 pharma businesses

30 hospitals outside the Basel area

6 Federal Offices

Switzerland & worldwide

Status September 2025

D-BSSE Professorships

Fostering Interdisciplinarity in Research

Together, experimental and computational biologists and engineers analyse, program and design biosystems in a new interdisciplinary manner. All three disciplines are represented in the department and work in close collaboration in order to develop novel approaches to biosystems science.

Dagmar Iber
Computational Biology

Jörg Stelling
Computational Systems Biology

Tanja Stadler
Computational Evolution

Mustafa Khammash
Control Theory and Systems Biology

Na Cai
Computational Medical Genomics (BRCCH)

Computation

Niko Beerenwinkel
Computational Biology

Gisbert Schneider
Computer-assisted Drug Design

Sylke Poehling
Professor of Practice

Michael Moor
Medical AI

Timm Schroeder
Cell Systems Dynamics

Sai Reddy
Systems and Synthetic Immunology

Barbara Treutlein
Quantitative Developmental Biology

Andreas Moor
Systems Physiology

NN
Synthetic Biology

Georg Holländer
Developmental Immunology

Randall Platt
Biological Engineering

Prisca Liberali
Multicellular Systems

Biology

Martin Fussenegger
Biotechnology and Bioengineering

Petra Dittrich
Bioanalytics

Engineering

Sven Panke
Bioprocess Engineering

Basile Wicky
Biomolecular Design

Andreas Hierlemann
Biosystems Engineering

Daniel Müller
Biophysics

Michael Nash
Molecular Engineering of Synthetic Systems

Konrad Tiefenbacher
Synthesis of Functional Modules

NN
Engineering Biomolecular Systems for Diagnostics (BRCCH)

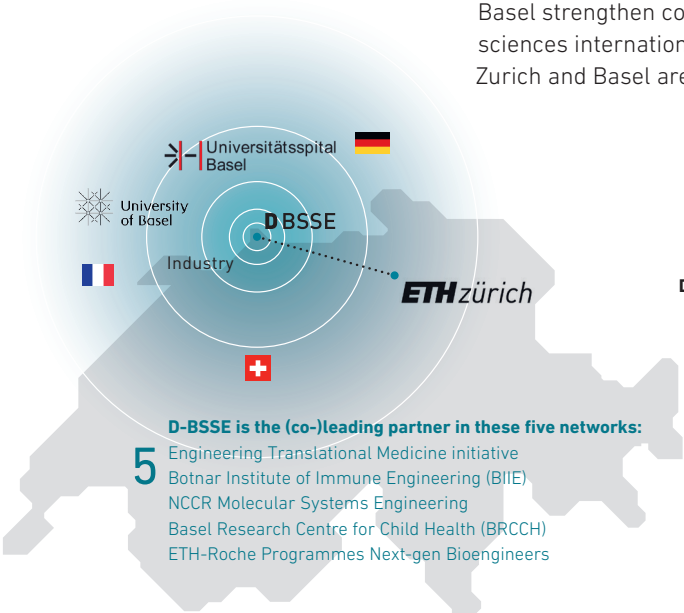
Department of Biosystems Science and Engineering

Interdisciplinary Research in Europe's Life Sciences Capital

The mission of the Department of Biosystems Science and Engineering (D-BSSE) is the understanding, rational design and programming of complex biological systems from the nanoscale up to whole organisms.

The department advances basic and applied biological sciences with the overall goal of translating its research into biomedical and industrial applications, and promoting the development of new processes and products in the biotech, pharmaceutical and chemical industries.

To maximise the impact of this ambitious endeavour, the department is located in Basel, the life sciences capital of Europe. In collaboration with partners from industry, hospitals and other academic institutions, the Basel location facilitates research applications in the emerging fields of precision medicine and personalised health, molecular systems engineering and data science. Education, research and entrepreneurship at D-BSSE in Basel strengthen collaboration in life sciences internationally and in the Zurich and Basel areas.



D-BSSE is the (co-)leading partner in these five networks:

5
- Engineering Translational Medicine initiative
- Botnar Institute of Immune Engineering (BIIE)
- NCCR Molecular Systems Engineering
- Basel Research Centre for Child Health (BRCCH)
- ETH-Roche Programmes Next-gen Bioengineers

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D-BSSE Scientific Facilities

High-tech for Scientific Advances

At D-BSSE, researchers, students and partners benefit from high quality instrumentation, laboratory work space and expertise in state-of-the-art scientific facilities.

The **Single Cell Facility** provides a broad range of high-end flow cytometry and advanced microscopy solutions. It specialises in automated life cell imaging with intelligent microscope control by customised image analysis programming, and in the integration of other technologies, such as microfluidics, into cellular analysis.

The **Basel Genomics Facility** is operated jointly with the University of Basel and grants direct access to cutting-edge next-generation sequencing (NGS) technologies, thus facilitating the systematic quantitative investigation of genome-wide experiments, including single-cell measurement.

The Microtechnological **Cleanroom Facility** provides services and processing capabilities to develop and fabricate complex microstructures and microfluidic devices, with all the required process steps to fabricate state-of-the-art devices.

The **Laboratory Automation Facility** offers a wide range of automated, robotics-based experimental process workflows, including fully automated cloning, cell culture production and life cell assays.

The **Animal Facility** is shared with the University of Basel and provides infrastructure and support for *in vivo* experiments using rodents.

ETH technology platforms located at D-BSSE:
_Good Manufacturing Practice (GMP) Facility
_NEXUS Personalized Health Technologies

D-BSSE Spin-off Companies

Enabling Entrepreneurial Ventures

D-BSSE researchers have made numerous prominent contributions to science, engineering and business development over the years. A total of 19 D-BSSE spin-off companies have been launched in the Zurich and Basel areas since the foundation of the department in 2007.

Fy Cappa BIOLOGICS *2024
novel therapeutics for antibody-based drugs

CreARTO Bioscience *2022
cell therapies to treat metabolic diseases

Engimmune Therapeutics *2021
high-throughput screening for T-cell receptor therapies

deepCDR *2019
therapeutic antibody discovery

VISIUM *2018
tailored machine learning solutions

UniteLabs *2017
laboratory automation systems

maxwell BIOSYSTEMS *2016
high-troughput, high-resolution functional imaging

ENGENE STATISTICAL CONSULTING *2014
computational genomics, statistics and visualisation

fgen *2011
high-throughput analysis of cellular libraries

insphero *2009
3D cell culture technology for predictive compound classification

ENCELTA *2023
T-cell products for cancer treatments

myria Biosciences *2021
novel chemical matters for unmet medical needs

OMNE POSSIBILE *2021
innovative xeno-nucleic acids

Pattern BioSciences *2018
next-gen gene and cell therapies

ValidityLabs *2016
education and services in blockchain technology

SHIFT CRYPTOSECURITY *2015
personal hardware devices to secure digital assets

MEMO THERAPEUTICS AG *2012
antibody discovery and immune repertoire analysis

BIOVERSYS *2010
anti-bacterial drug discovery

Zurich Instruments *2008
high-frequency and ultra-high frequency instrumentation

D-BSSE Teaching

Investing in Next Generation Biosystems Scientists

Teaching is a cornerstone of the department's activities. At D-BSSE, the interdisciplinary mindset in biology, engineering and computational science is mirrored in its teaching programmes.

D-BSSE offers two Master's programmes:

MSc Biotechnology
The MSc in Biotechnology is a two-year programme (120 credit points) with the objective of giving highly qualified students an excellent research-focused education in the crucial field of modern biotechnology and its biomedical and industrial applications. Find more information at **www.master-biotech.ethz.ch**.

MSc Computational Biology and Bioinformatics
The MSc in Computational Biology and Bioinformatics (CBB) is a two-year programme (120 credit points), offered in cooperation with the University of Basel and the University of Zurich. Students are trained in the development and application of computational methods for biological systems analysis. It includes practical course work in biology and computer science methods and their combination, and places particular emphasis on the systematic integration of experimental biology and data generation into computational approaches. Find more information at **www.cbb.ethz.ch**.

D-BSSE doctoral programmes:

Doctoral studies are an important pillar of the educational efforts at D-BSSE, as they represent the transition from learning to original scientific research. Departmental efforts are complemented by the Life Science Zurich Graduate School. Find more information at **www.bsse.ethz.ch/doctorate.html**.

"I joined the CBB Master's programme because I was interested by its interdisciplinary subject and the variety of teaching and research topics at the D-BSSE. I greatly enjoyed the research projects I did during my studies and decided to stay for a doctorate. I enjoy discussing ideas with colleagues from different backgrounds and hearing about the state-of-the-art research conducted at D-BSSE; or participating in events such as the PhD days, which give me the opportunity to reflect on my next career step."

Constance Le Gac, doctoral student in Jörg Stelling's group.

"What fascinated me about the D-BSSE is its unique blend of cutting-edge research in biotechnology and computational biology. Its strategic location in Basel, coupled with the extensive support from the broader ETH ecosystem, facilitates the translation of science into tangible real-world impact. This is what enabled my colleagues and me to launch a successful spin-off company based on our research at D-BSSE."

Simon Friedensohn, former doctoral student in Sai Reddy's group and co-founder of the ETH spin-off deepCDR Biologics.

Where do our graduates go after completing their studies at D-BSSE?