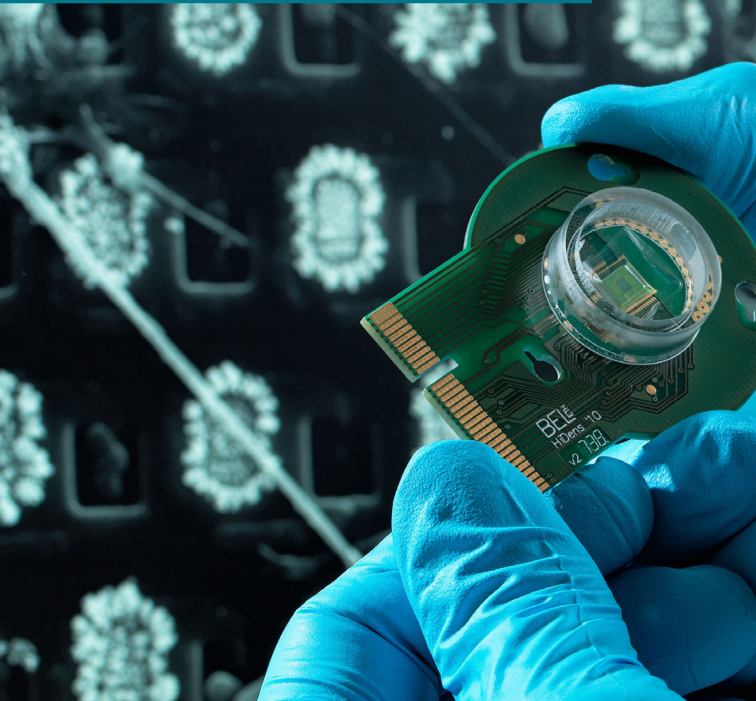


**Department of Biosystems
Science and Engineering**

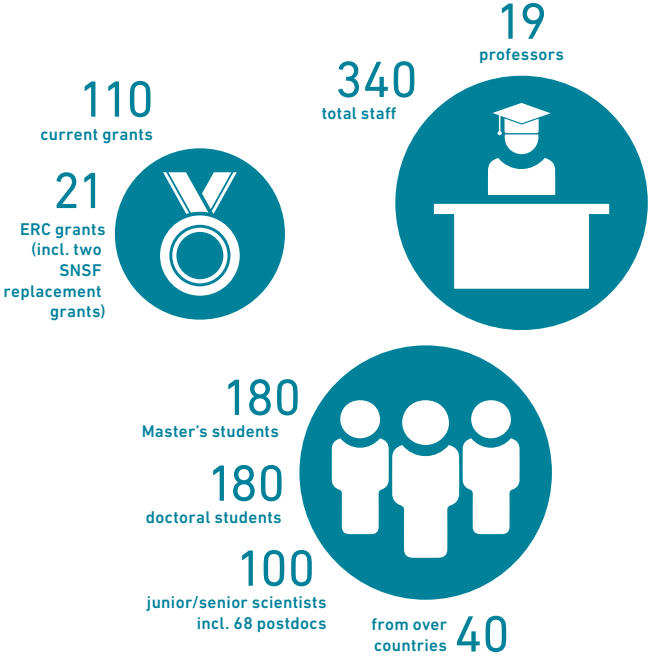


Department of Biosystems Science and Engineering

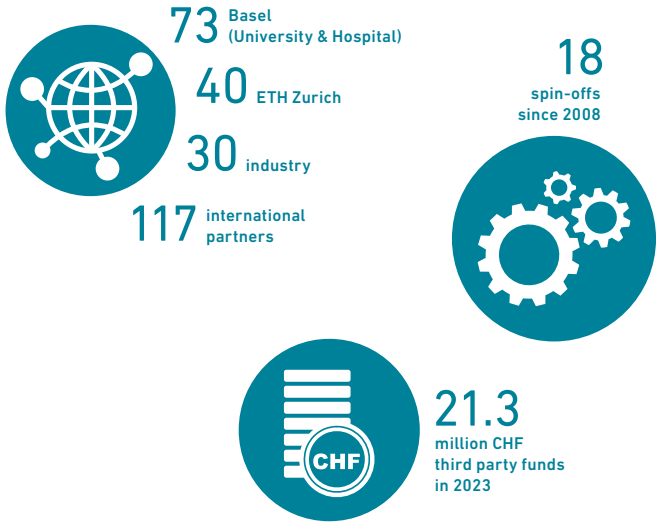
From the Theory of Biosystems to Understanding and Engineering Cells and Organisms

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.



Collaborations



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.



Tanja Stadler
Computational
Evolution Group



Dagmar Iber
Computational Biology



Jörg Stelling
Computational
Systems Biology



Mustafa Khammash
Control Theory and
Systems Biology Laboratory



Computation



NN
Computational
Medical Genomics
(BRCC)



NN
Medical AI



Niko Beerenwinkel
Computational
Biology Group



NN
Professor of Practice



Barbara Treutlein
Quantitative Developmental Biology Lab



Biology



Timm Schroeder
Cell Systems
Dynamics Group



Georg Holländer
Developmental
Immunology



Martin Fussenegger
Biotechnology and
Bioengineering Group



Andreas Hierlemann
Bio Engineering Laboratory



Konrad Tiefenbacher
Synthesis of Functional Modules



Andreas Moor
Systems Physiology



Randall Platt
Laboratory for
Biological Engineering



Sven Panke
Bioprocess Laboratory



NN
Engineering Biomolecular
Systems for Diagnostics
(BRCH)



Sai Reddy
Laboratory for Systems and
Synthetic Immunology



Renato Paro
Epigenomics Group
(Prof. em.)



Petra Dittrich
Bioanalytics Group



Basile Wicky
Lab for Biomolecular
Design (start in June '24)



Michael Nash
Lab for Molecular Engineering
of Synthetic Systems



NN
Synthetic Biology



NN
Molecular Systems

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 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 18 D-BSSE spin-off companies have been launched in the Zurich and Basel areas since the foundation of the department in 2007.


 **myria**
Biosciences
novel chemical matters for unmet
medical needs (2021)

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


 **deepCDR**
therapeutic antibody discovery (2019)

 **VISIUM**
tailored machine learning solutions (2018)


 **UniteLabs**
laboratory automation systems (2017)

 **maxwell**
BIOSYSTEMS
high-throughput, high-resolution
functional imaging (2016)


 **ENG-ONE**
STATISTICAL CONSULTING
computational genomics, statistics and
visualisation (2014)


 **fgen**
high-throughput analysis of cellular
libraries (2011)

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

 **CreARTO**
Bioscience
cell therapies for the treatment of
metabolic diseases (2022)

 **OMNE**
POSSIBLE
innovative xeno-nucleic acids (2021)

 **Pattern**
BioSciences
next-gen gene and cell therapies (2018)

 **aiNET**
immune-informatics for the discovery of
therapeutic antibodies (2017)

 **ValidityLabs**
education and services in blockchain
technology (2016)

 **SHIFT** 
CRYPTOSECURITY
personal hardware devices to secure
digital assets (2015)

 **MAEMO**
THERAPEUTICS AG
antibody discovery and immune
repertoire analysis (2012)

 **BIOVERSYS**
anti-bacterial drug discovery (2010)

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

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.

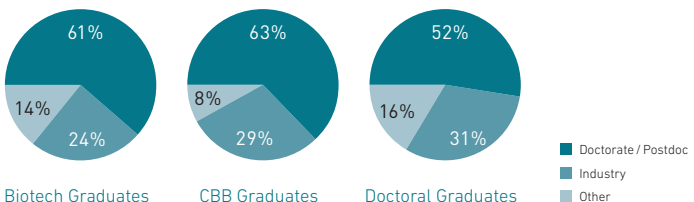


"I joined the CBB Master's programme because I was interested by its interdisciplinary subject and the variety of teaching and research topics at the D-BSSE. I greatly enjoyed the research projects I did during my studies and decided to stay for a doctorate. I enjoy discussing ideas with colleagues from 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?



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.



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