

**Registration Form**  
**Biosystems Engineering**  
**Braunwald, Switzerland**  
**11 - 16 September, 2016**

First Name .....  
Last Name .....  
Firm / Organization .....  
Address .....  
.....  
Phone, Fax .....  
Email .....

☐ I register for the course.

☐ Biologist      ☐ Chemist  
☐ Engineer      ☐ (Bio)Informatitian  
☐ Other, Specify .....

I bring my personal computer:  
☐ YES      ☐ NO

Send or fax this form to:

**Prof. E. Heinzle**  
**Biochemical Engineering**  
**Saarland University**  
**D-66123 Saarbrücken**  
**Germany**

Tel.: +49 - 681 - 302 2905

Fax: +49 - 681 - 302 4572

Email: [e.heinzle@mx.uni-saarland.de](mailto:e.heinzle@mx.uni-saarland.de)

Total payment of Euro 2900.- for course and accommodations.

A fee of Euro 50.- is charged for the supply of a computer.

Payments should be made by bank transfer after billing.

Late cancellations are subject to a fee of Euro 500.-.

**Bioreactor Modelling and Simulation**

Mass and energy balances  
Kinetics & stoichiometry  
Batch, fed-batch & continuous operation  
Heat and mass transfer  
Scale-up & scale-down  
Cell Modelling & Simulation

**Metabolic network reconstruction**

<sup>13</sup>C metabolic flux analysis  
Elementary flux mode analysis  
Flux balance analysis  
Dynamic metabolic & regulatory networks  
Prokaryotic & eukaryotic systems

**Model-Based Design of Cells & Bioreactors**

Prediction of optimum yields & pathways  
Multi-omics driven strain engineering  
Design principles of metabolic networks  
Multi-scale models - Cells & bioreactor  
Experimental design strategies  
Bioprocess design

**Industrial Case Studies**

Mammalian cells for high-value therapeutics  
Microbial recombinant protein production  
Bio-based chemicals and materials  
High-cell density production  
Processing renewable raw materials  
Whole cell biocatalysis

**Exercises and Workshops**

Computer aided exercises -  
Berkeley Madonna & MATLAB software  
Supporting computational tools  
Workshops on selected topics

**COURSE ANNOUNCEMENT**

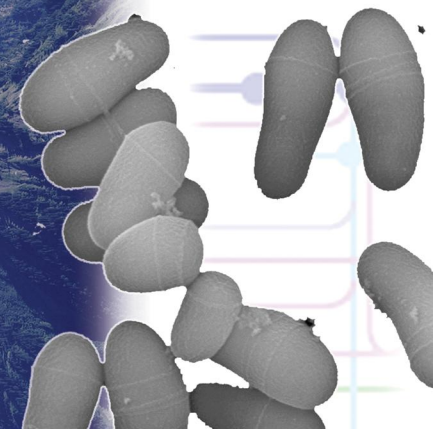
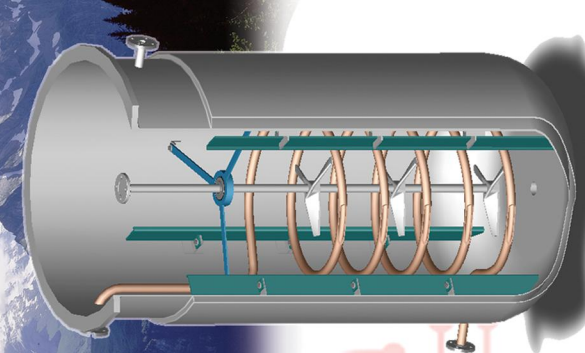
**Biosystems Engineering**  
**Bioreactors and Cell Factories**

**Modelling and Simulation**  
**Experimental Methods**

**11 - 16 September, 2016**

**BRAUNWALD, SWITZERLAND**

[www.braunwald-bioengineering.de](http://www.braunwald-bioengineering.de)





## The Instructors

### Prof. Elmar Heinzle

Biochemical Engineering  
Saarland University,  
Saarbrücken, Germany



### Prof. Matthias Reuss

Stuttgart Research Center  
Systems Biology  
University Stuttgart, Germany



### Prof. Christoph Wittmann,

Institute of Systems Biotechnology,  
Saarland University, Saarbrücken,  
Germany



### Guest Lecturer

to be announced

## Teaching Methods

Small group size	Informal lectures
Book with software	PC simulation exercises
Instructor interaction	Research discussions

## Time and Location

11 - 16 September, 2016 (18.00 Sunday - 14.00 Friday)  
Hotel Bellevue, Braunwald, Switzerland  
Morning and evening instructions  
Afternoons free for mountain walking, tennis or leisure.

Reached by cable railway, the auto-free village of Braunwald is situated at 1300 m, far above the Linth Valley and close to high mountains (3600 m). In 1.5 hours it is connected by train to Zurich main station and airport.  
The Hotel Bellevue is an ideal, quiet location, and it is well equipped, comfortable, offers free WLAN and serves excellent meals.

## Registration and Information

Apply to  
Elmar Heinzle  
Biochemical Engineering  
Saarland University, Campus A1.5  
D-66123 Saarbrücken, Germany  
Tel.: +49 - 681 - 302 2905  
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Email: [e.heinzle@mx.uni-saarland.de](mailto:e.heinzle@mx.uni-saarland.de)  
Website: [www.braunwald-bioengineering.de](http://www.braunwald-bioengineering.de)

## All-Inclusive Course Fee

The all-inclusive fee of Euro 2900.- includes manual, book, software, single room with bath and all meals.

A fee of Euro 50.- is charged for the supply of a computer.  
Payments should be made by bank transfer after billing.  
Late cancellations are subject to a fee of Euro 500.-.

The course “**Biosystems Engineering**” is **uniquely combining modelling and simulation of bioreactors and biological systems**. With continuous updates reflecting the newest trends and developments in biotechnology research, it has successfully conveyed expert knowledge to participants from academia and industry since 1981. Enabled by the interdisciplinary expertise of the lecturers, it integrates the quantitative description and engineering of metabolic systems with their reactor environment and thereby provides the full picture for successful strain and bioprocess development at the frontier of current research.

A speciality of the course is the **hands-on use of simulation software and relevant exercises**. Using examples from our book "Biological Reaction Engineering" and the easy-to-use simulation program Berkeley Madonna, the participants gain solid understanding of physical systems in biotechnology and their models and they can directly interact by changing process parameters and interpreting the graphical output. This greatly enhances the learning of mathematical modelling. Further exercises on metabolic networks use different software packages integrated in MATLAB, which will also be available during the course.

**The intentionally kept small group size provides a great learning atmosphere and close personal interactions with the lecturers.** This gives rich opportunities to react to particular interests of the participants for special topics, workshops, and individual simulation problems. The teaching material outlines state-of-the-art methods as they are applied today in academic and industrial research and development.

**The participants and instructors live together in one of the most excellent Swiss mountain hotels.** The course is scheduled for the morning and evening hours. The afternoons are usually reserved for a range of other activities, the most important of which is mountain walking and climbing. Often assisted with lifts to the top, we are able to enjoy the alpine world at 2000 m, from where the neighbouring peaks look very majestic. The special atmosphere of the course greatly enhances the learning experience. More details are given on our website.