



PhD Summer Course (4 ECTS points) Synthetic Biology: From pro- to eukaryotic systems (SYNBIOSYS)

During the CPSC Summer School different topics ranging from defining synthetic biology over available genetic tools and regulatory modules to engineering of organisms for commercial applications will be addressed. A further focus will be on DNA memory devices in *E.coli* and the application of artificial regulatory switches on DNA and protein level. The current status of synthetic biology in *E.coli*, yeast, cyanobacteria and plants to date and future prospects will be covered and real examples from commercialization of yeast bio-products will be given.

Topics

- **Choice of organisms (chassis):** (cyano-) bacteria (*Synechocystis*, *E.coli*), yeast, algae, higher plants (chloroplasts).
- **The tool box:** Promoters for regulated expression, transcript and protein stabilization and modifications, vectors, neutral integration, DNA synthesis, DNA memory devices, flip elements for on-off gene expression regulation, artificial protein switches (microProteins)
- **Cloning and high-through-put methodologies:** cloning methods, gene stacking, gene replacement strategies.
- **Bioreactors:** types (closed, open ponds, etc.), designs of growth regimes (continuous versus batch), harvesting methods and product recovery.
- **Downstream processing:** product extraction, stabilization and quality control
- **Ethics in synthetic biology.**
- **Safety and regulations.**
- **Intellectual property rights (IPR)**

Teachers

Prof. **Andreas Weber**, Cluster of Excellence on Plant Sciences, Heinrich Heine University, Düsseldorf

Prof. **Neil Hunter**, Dept. of Molecular Biology and Biotechnology, University of Sheffield

Managing Director, CSO **Jørgen Hansen**, Evolva.

Postdoc **Andrew Hitchcock**, Dept. of Molecular Biology and Biotechnology, University of Sheffield

Postdoc **Jesús Fernández-Rodríguez**, Dept. of Biological Engineering, Massachusetts Institute of Technology

Associate Prof., **Bjørn Hamberger**, Section for Plant Biochemistry, UCPH

Associate Prof. **Sune Holm**, Dept. of Media, Cognition and Communication, UCPH

Prof. **Dario Leister**, Head of Copenhagen Plant Science Centre, UCPH

Prof. **Poul Erik Jensen**, Vice-head Copenhagen Plant Science Centre, UCPH

Associate Prof. **Mathias Pribil**, Young Investigator at Copenhagen Plant Science Centre, UCPH

Associate Prof. **Stephan Wenkel**, Young Investigator at Copenhagen Plant Science Centre, UCPH

Assistant Prof. **Fernando Geu-Flores**, Young Investigator at Copenhagen Plant Science Centre, UCPH

Assistant Prof. **Sebastian Marquardt**, Young Investigator at Copenhagen Plant Science Centre, UCPH

PROGRAM -Synthetic Biology: From pro- to eukaryotic systems (SYNBIOSYS) - 24-28 August 2015

Module: Introduction to Synthetic biology/ Case study I	Module: Photo-Synthetic biology approaches	Module: Synthetic Switches/ Case study II	Module: Applied Synthetic Biology I	Module: Applied Synthetic Biology II/ IP and Ethics
Day 1 - Mon 24/8	Day 2 - Tue 25/8	Day 3 - Wed 26/8	Day 4 - Thur 27/8	Day 5 - Fri 28/8
9.00-9.30: Welcome and introduction.	9.00-10.00: Cyanobacterial photosynthesis. (Neil Hunter)	9.00-10.30: Genome editing strategies. (Andreas Weber)	9.00-10.30: Engineering carbon assimilation to increase carbon conversion efficiency. (Andreas Weber)	9.00-10.30: Ethics in Synthetic biology. (Sune Holm)
9.30-12.00: Poster presentations. Participants introduce their own area of interest to the group. With coffee and tea.	10.00-12.15: Presentation of 1st assignment. With coffee and tea. (YI+ guest speakers)	10.30-10.45: Break 10.45-12.15: DNA memory devices. (Jesús Fernández-Rodríguez)	10.30-10.45: Break 10.45-12.00: Synthetic biology in yeast for commercial applications. (Jørgen Hansen)	10.30-10.45: Break 10.45-12.15: Presentation of 2nd assignment. (YI + guest speakers)
12.00-13.00 Lunch	12.15-13.15 Lunch	12.15-13.15 Lunch	12.15-13.15 Lunch	12.15-13.15 Lunch
13.00-14.00: General Introduction to synthetic biology and available toolboxes. (Sebastian Marquardt)	13.15-15.00: Synthetic biology in cyano-bacteria. (Andrew Hitchcock)	13.15-15.00: microProteins - synthetic switches. (Stephan Wenkel)	13.15-15.15: Group activity. (Mathias Pribil)	13.15-15.00: IP aspects from a scientist's perspective. (Bjørn Hamberger)
14.00-15.00: General Introduction to model organisms for synthetic biology. (Fernando Geu-Flores)				
15-15.30 Break	15-15.30 Break	15-15.30 Break		
15.30 -17.30: 1st Assignment on Synthetic biology (YI+ guest speakers)	15.30 -17.00: Light driven synthesis. Poul Erik Jensen)	15.30 -17.30: 2nd assignment on Synthetic biology (YI+ guest speakers)	Dinner - BBQ	15-15.30 Course evaluation, closing, goodbye.



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Practical information

Where:

University of Copenhagen, Department of Plant and Environmental Sciences
Thorvaldsensvej 40
1871 Frederiksberg
Room: TBC

When:

24-28 August 2015

Course fee:

1500 DKK that covers lunch and refreshments during the course and an excursion/
social dinner.

Poster presentation

In preparation for the course, students should prepare and bring a poster (A3 size) about their work or area of interest. The poster will be presented on the first day of the course.

For more information and registration:

<http://cpsc.ku.dk/calendar/2015/summer-school-2015/>