EUROPEAN FEDERATION OF BIOTECHNOLOGY

WORKING GROUP ON BIOREACTOR PERFORMANCE

in collaboration with

European Section on Biochemical Engineering Science

BIOPROCESS ENGINEERING COURSE

Doctoral /Post-doctoral level

Supetar, Island of Brac, Croatia

19 – 26. September 2010

http://www.globtour.hr/bec2010

http://www.efb-central.org/index.php/Main/events/bioprocess_engineering_course1/

BIOPROCESS ENGINEERING COURSE

The next course in the long line of highly successful courses since the mid-1980s on Bioprocess Engineering will take place from **19th – 26th September 2010**. Like the last one in 2008, it will be held on the beautiful Island of Brac, Croatia in the Adriatic Sea. It is organised under the auspices of The European Federation of Biotechnology by the Working Group on Bioreactor Performance, in collaboration with other Working Groups (Working Group on Modelling, Monitoring, Measurement & Control and Working Group on Downstream Processing and Recovery of Bioproducts) of the Section on Biochemical Engineering Science. All of the lectures will be given by internationally distinguished university teachers or by leading experts from multinational companies. The course covers the full spectrum of bioprocess engineering, starting from genetic concepts for micro-organisms used to produce pharmaceutical and other products via microbial physiology, bioreaction kinetics to bioreactor design and scale-up. The organisms considered range from simple bacteria to highly specialised animal cell cultures. There is also a strong coverage of measurement, control and optimisation and how they interact with each other and with the specific bioreaction of interest. Finally, there is a broad-brush coverage of downstream processing. The lectures are supplemented by computer-based (MATLAB) exercises (no previous experience of MATLAB is required), discussions and a Case Study and participants are also encouraged to bring posters of their work. Selected candidates will be invited to make short oral presentations (of approximately 5 minutes duration), at a 'Speakers' Corner', to be held during the course. Finally, there is a strong social programme, specifically designed to ensure that there are many opportunities to discuss the course with the lecturers.

The course is directed specifically at Ph.D. students and experienced biotechnologists from research institutes, universities and industry. Participants are expected to have a background in chemical/biochemical engineering, biotechnology, a biological science or a related discipline. The lecturers are all acknowledged specialists in their fields, so that the course also provides a forum for highlighting recent research in relevant areas.

Lecturers

Prof. Dr. Joseph Lengeler, Universität Osnabrück, Germany
Prof. Dr. Sven-Olof Enfors, Royal Institute of Technology, Sweden
Prof. Dr. John Villadsen, Technical University of Denmark,
Prof. Dr. Matthias Reuss, Stuttgart University, Germany
Prof. Dr. Andreas Lübbert, Martin-Luther-University Halle-Wittenberg, Germany
Prof. Dr. Alvin Nienow, University of Birmingham, United Kingdom
Prof. Dr. Bernhard Sonnleitner, Technicum, Winthertur, Switzerland
Dr. Christian Leist, Novartis Pharma Ltd. Switzerland
Dr. Henk Noorman, DSM Anti-Infectives, Delft, The Netherlands
Prof. Dr. Luuk A.M. van der Wielen, Technical University Delft, The Netherlands
Prof. Dr. Marin Berovic, University of Ljubljana, Slovenia
Prof. Dr. David Mitchell, Universidade Federal do Parana, Brasil
Prof. Dr. Jochen Büchs, Aachen University, Germany
Prof. Dr. Chris J.Hewitt, Loughborough University, United Kingdom
Prof. Dr. Sten Bay Jörgensen, Technical University of Denmark,

POSTER PRESENTATION

Poster dimensions should not exceed 1.0 m x 1.0 m. Every poster should include a title and author name(s). The posters will be on display in front of the lecture hall throughout the course for informal discussions. On the basis of the posters a group of selected candidates will be invited to make short (5 minutes) oral presentations at a ´Speakers´corner´.

SOCIAL PROGRAMME

The social programme for all participants and tutors will include several special events: a 'get together' party, to which, it is suggested, each participant might bring a bottle of a typical drink from his/her native country; an introduction to the art of professional wine tasting followed by a sampling of selected Croatian wines; an island sight-seeing trip including a visit to the peak of the famous Vidova Gora mountain; a picnic on the famous beach of the Golden Horn and a farewell party. Additional programmes for accompanying persons are available.

DATE AND VENUE

The EFB Bioreactor Engineering Course will be held between Sunday, **September 19th** and **Friday, September 26th 2010** on the Island of Brac, Croatia. The lectures will commence at 15:00 h on **September** 19th. The course will conclude in the evening on **September 26th**. Departure is scheduled on **Saturday morning September 27th**.

The venue for the course is the small, picturesque Dalmatian town of Supetar, placed on the mountainous island of Brac, the pearl of the Adriatic Sea famous for some of the most beautiful beaches in the Mediterranean especially the Golden Horn. The island of Brac is situated a few kilometres from Split, an old Dalmatian harbour on the mainland with the famous summer palace of the Roman Emperer Diokletian. Split has an international airport that is well connected with all major airports in Europe.

During the Course, the accommodation and meals will be provided at the Hotel Resort Velaris located within 15 minutes walking distance of the small town of Supetar. Transfer from Split harbour to Supetar is via frequently-running ferry-boats. Mini-bus transportation will be available between Supetar harbour and the Hotel Resort Velaris. Island Brac also has its own airport, directly accessible from a few airports in the region.

Although Croatia has no visa requirements for many countries the participants are advised to check whether or not they require a visa for entering Croatia.

PROGRAMME

Day 0: Sunday, September 19th

Arrival, registration

Introductory Talks (optional *attendance):*

16.15-17.15 *a*) **Basic Biological Concepts: S.-O. Enfors**

17.15-18.00 b) **Basic Engineering Balances: H. J. Norman**

18.00-18.15 Welcoming Address: **A. Lubbert, A. W. Nienow and M. Berovic**

18.15-19.00 *Lecture 0.* **Introduction to Bioprocess Engineering*:* J. Villadsen**

19.15-20.30 Dinner

20.30 Welcome Party

Day 1: Monday, September 20th

09.00-09.45 Lecture 1. **Metabolic Networks I: J. Lengeler**

09.45-10.30 Lecture 2. **Metabolic Networks II: J. Lengeler**

10.30-11.00 ***Coffee***

11.00-11.45 *Lecture* 3. **Stoichiometry: J. Villadsen**

11.45-12.30 *Lecture* 4. **Kinetics: J. Villadsen**

12.30-14.00 Lunch

14.00-14.45 *Lecture* *5.* **Dynamic Modelling of Metabolism: M. Reus**

14.45-15.30 *Lecture* *6.* **Measurement of Intracellular Metabolites: M. Reus**

15.30-16.00 ***Coffee***

16.00-18.45 **Exercise 1. Stoichiometry/Microbial Physiology/Case Study 1: (Villadsen/Lengeler/Noorman)**

19.00-20.30 ***Dinner***

20.45 **Wine Culture and Art of Wine Tasting in Europe: M. Berovic**

Day 2: Tuesday, September 21th

09.00-09.45 Lecture 7. **Rheology, Mass and Heat Transfer H. J. Norman**

09.45-10.30 Lecture 8. **Stirred Bioreactors A. W. Nienow**

10.30-11.00 ***Coffee***

11.00-11.45 *Lecture 9.* **Airlift Bioreactors A. Lubbert**

11.45-12.30 *Lecture 10.* **Fed Batch and Continuous Culture S.-O. Enfors**

12.30-14.00 Lunch

14.00-14.45 *Lecture 11.* **Scale-up and Scale-down A. W. Nienow**

14.45-15.30 *Lecture 12.* **Bioprocess Engineering Studies at the Microwell and Shake Flask Scale J. Buechs**

15.30-16.00 ***Coffee***

16.00-18.45 **Exercise 2. Cultivation Techniques/Case Study 2 (Enfors/Noorman/Nienow)**

19.00-20.30 ***Dinner***

20.45 **Speakers Corner C. J. Hewitt**

Day 3: Wednesday, September 22nd

9.00-9.45 *Lecture 13.* **Engineering Parameters for Industrial Animal Cell Culture Bioprocess Development C. Leist**

9.45-10.30 *Lecture 14.* **Process Analytical Technologies (PAT) for Control of Large Scale Cell Culture Bioprocesses C. Leist**

10.30-11.00 ***Coffee***

11.00-11.45 *Lecture* 15.**Bioreactor Engineering for Large Scale Animal Cell Culture A. W. Nienow**

12.00 Excursion to Vidova Gora Mountain and Picnic on Golden Horn Beach

Day 4: Thursday, September 23th

9.00-9.45 *Lecture 16.* **Single Cell Analysis for Informed Recombinant Protein Production, C.J. Hewitt**

9.45-10.30 *Lecture 17.* **Integrated approach to development of recombinant protein processes with *Pichia pastoris*, S.- O. Enfors**

10.30-11.00 ***Coffee***

11.00-11.45 *Lecture 18.* **Solid State Fermentation M. Berovic**

11.45-12.30 *Lecture 19.* **Antibiotics H. Norman**

12.30-14.00 ***Lunch***

14.00-14.45 *Lecture 20.* **Downstream Processing I L. van der Wielen**

14.45-15.30 *Lecture 21.* **Downstream Processing II L. van der Wielen**

15.30-16.00 ***Coffee***

16.00-16.45 *Lecture 22.* **Downstream Processing III L. van der Wielen**

16.45-18.45 **Exercise 3.** *Case Study 3* **- Downstream Processing L. van der Wielen**

19.00-20.30 ***Dinner***

20.45 **Get Together Party with Tasting of Participants 'National Delights'**

Day 5: Friday, September 24th

9.00-9.45 *Lecture 23.* **Monitoring of Bioprocesses I B. Sonnleitner**

9.45-10.30 *Lecture 24.* **Monitoring of bioprocesses II B. Sonnleitner**

10.30-11.00 Coffee

11.00-11.45 *Lecture 25.* **Control I S. B. Jorgensen**

11.45-12.30 *Lecture 26.* **Control II S. B. Jorgensen**

12.30-14.00 Lunch

14.00-14.45 *Lecture 27.* **Process optimisation A. Lubbert**

15.00 -15.30 Coffee

15.30-18.45 **Exercise 4.** *Case Study 4* - **Optimisation and Control (van der Wielen/Jorgensen)**

19.00-20.30 ***Dinner***

20.45**Farewell Party and Presentation of Case Study Prize**

CHAIRMAN OF THE ORGANIZING COMMITTEE

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