

George R. Brown School of Engineering
Department of Chemical & Biomolecular Engineering

Presents



Dr. Jens Nielsen

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Chalmers University of Technology
Gothenberg, Sweden**

**Wednesday, October 29, 2008
Duncan Hall – Room 1070 - 2:30 p.m.**

Reception to follow in Abercrombie B237

“Industrial Systems Biology: Yeast and Filamentous Fungi as Cell Factories for Sustainable Production of Chemicals”

The yeast *Saccharomyces cerevisiae* and the filamentous fungus *Aspergillus niger* are used extensively in the fermentation industry for the production of a range of different products, such as fuels, fine chemicals, food ingredients, enzymes, protein drugs, vaccines, beer, wine and bread. In connection with further development of bioprocesses for sustainable production of fuels and chemicals these fungi are interesting versatile cell factories. *S. cerevisiae* is interesting as it is easy to perform directed genetic modifications and an extensive systems biology tool box is available for identification of metabolic engineering targets. *A. niger* is interesting as it tolerates low pH, can utilize a wide range of carbon sources and has relatively high conversion rates. In connection with developing *S. cerevisiae* and *A. niger* as general cell factory platforms we have established a number of systems biology technologies that can be used for enhancing the metabolic engineering of these organisms in the future. These techniques include genome scale metabolic models, in which there is a direct link between reactions, enzymes and genes and hereby it is possible to rapidly map transcriptional changes on global metabolic maps. For *A. niger* the model contains a large number of extracellular reactions for the degradation of complex carbohydrates, and these reactions form a complex network which has been analyzed using genome-wide transcription analysis during growth on different carbon sources, e.g. glucose, xylose, xylan, starch and arabinan. For transcription analysis we are using the Affymetrix platform and for *A. niger* we use a custom-designed DNA array, that covers all of the about 12,000 ORFs identified in the recently released DOE sequencing effort. In the lecture there will be given an overview of the application of these two fungi as cell factories, the advancement towards a wider use of these organisms and some projections for the future chemical production using fermentation will be given.

ABOUT THE SPEAKER

Jens Nielsen, Ph.D. is a leading researcher in the field of metabolic engineering and systems biology. He has a Master of Science (MSc.) in Chemical Engineering and a Ph.D. in Biochemical Engineering from the Technical University of Denmark (DTU). In addition to his current appointment at Chalmers University of Technology, he is an adjunct professor in Department of Biotechnology at NTNU in Norway (2005-present). Dr. Nielsen has organized more than fifteen advanced courses in metabolic engineering and systems biology in Denmark, Sweden, Thailand, China and Chile. He is co-author of seven books, including three textbooks, and a contributor to another twenty books. Dr. Nielsen is co-author of over 240 research papers published in scientific journals. His research has resulted in fifteen patents and patent applications.