

Program

Biochemical Engineering XV:

Engineering Biology from Biomolecules to Complex Systems

July 15–19, 2007

Québec City, Canada

Conference Chairs

Michael Betenbaugh

Johns Hopkins University

Vijay Yabannavar

Trubion Pharmaceuticals

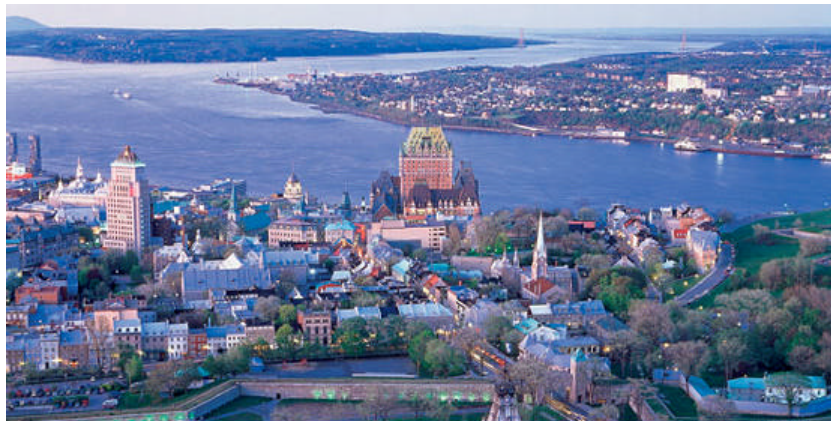
Vice Chairs

Anne Robinson

University of Delaware

Eugene Schaefer

Bristol-Myers Squibb Company



Quebec City Harbor

ECI

Engineering Conferences International

6 MetroTech Center

Brooklyn, NY 11201, USA

Phone: 1-718-260-3743, Fax: 1-718-260-3754

www.engconfintl.org - info@eci.poly.edu

Scientific Advisory Committee

Bob Adamson, Wyeth; John Aunins, Merck; Harvey Blanch, UC Berkeley;
Arindam Bose, Pfizer; Steve Brown, Novo Nordisk; Trent Carrier, Invitrogen;
Manuel J. Carrondo, IBET; Jeff Chalmers, Ohio State University;
Gopal Chotani, Genencor; David Chang, Genentech; Wilfred Chen UC Riverside;
Arthur Coury, Genzyme; Jon Dordick, RPI;
Martin Fussenegger, ETH Switzerland; Alain Garnier, Laval University;
Steve Gorfien, Invitrogen; Stefanos Grammatikos, Boehringer Ingelheim;
David Gray, Codexis; Wei-Shou Hu, University of Minnesota;
Amine Kamen, BRI Canada; Robert Kiss, Genentech;
Konstantin Konstantinov, Genzyme; Lisa Laffend, DuPont;
Kelvin Lee, Cornell University/University of Delaware; Sang Yup Lee, KAIST;
Steven Lee, Bristol-Myers Squibb; James Liao, UCLA; David Lindsay, MedImmune; Duncan
Low, Amgen; Ram Mandalam, Cellerant; Jim Michaels, BioMarin;
Bill Miller, Northwestern University; Costas Maranas, Penn State University;
Jens Nielsen, TU Denmark; Jamie Piret, University of British Columbia;
Octavio Ramirez, UNAM; Tina Sauerwald, Centocor;
George Schmid, Hoffman-LaRoche AG; Dane Wittrup, MIT;
Peter Zandstra, University of Toronto.

Engineering Conferences International (ECI) is a global engineering conferences program, originally established in 1962, that provides opportunities for the exploration of problems and issues of concern to engineers and scientists from many disciplines. The ECI program is a not-for-profit partnership between the Engineering Conferences Foundation (ECF) and Polytechnic University.

ECF BOARD MEMBERS

Barry C. Buckland

Allen I. Laskin

Raymond McCabe

Eli Pearce

David K. Robinson

P. Somasundaran

Chair of ECI Conferences Committee: Jules Routbort

ECI Technical Liaison for this conference: Allen Laskin

Polytechnic University President: Jerry Hultin

Polytechnic Liaison to ECF: T.C. Westcott

ECI Director: Barbara K. Hickernell

ECI Associate Director: Kevin Korpics

Sunday, July 15, 2007

- 13:00 – 15:00 Registration – Refreshments and snacks will be served. (*Foyer 3rd*)
- 14:50 – 15:00 Opening Remarks (*Suzor-Cote Krieghoff*)
- 15:00 – 16:30 **Post-Translational Processing and Molecular Assemblies**
(*Suzor-Cote Krieghoff*)
Session Chairs: Theresa Good, University of Maryland, Baltimore County
Wai Lam Ling, Schering Plough
Diethard Mattanovich, University of Natural Resources
& Applied Life Sciences, Austria
- 15:00 – 15:25 Jim Swartz, Stanford University
Cell-free production of complex molecular assemblies: Hydrogenases and virus-like particle vaccines
- 15:25 – 15:45 Laura Palomares, Universidad Nacional Autónoma de Mexico
Following rotavirus-like particle production and assembly and disassembly kinetics: Towards the production of nanomaterials
- 15:45 – 16:10 Martin Gawlitzek, Genentech
Toward understanding and controlling the effects of cell culture conditions on glycosylation of recombinant proteins
- 16:10 – 16:30 Matt Delisa, Cornell University
Humanization of *N*-linked glycosylation machinery in bacteria
- 16:30 – 17:00 Coffee Break (*Foyer 3rd*)
- 17:00 – 18:00 **Biomolecular Evolutions and Revolutions: DNA, RNA and Proteins**
(*Suzor-Cote Krieghoff*)
Session Chairs: Ranjan Srivastava, University of Connecticut
Huimin Zhao, University of Illinois
- 17:00 – 17:25 David Estell, Genencor
Systematic evaluation of sequence/ activity relationships in an entire protein
- 17:25 – 17:50 Greg Stephanopoulos, Massachusetts Institute of Technology
Evaluating the potential of *Transcriptional Engineering* in eliciting new multigenic cellular phenotypes
- 18:00 – 18:45 Social Hour (*The Galerie Bar Main Lobby*)
- 18:45 – 20:00 Dinner (*Place Montcalm +JP Lemieux*)
- 20:00 – 21:00 **Plenary I**
(*Suzor-Cote Krieghoff*)
Guido Grandi, Novartis Vaccines
Vaccine Development

Sunday, July 15, 2007 (continued)

21:00 – 23:00

Poster Session A – Sponsored by Merck

(Leduc-Fortin-Morrice-Lismer, Pilot, Foyer, Foyer 3rd, Borduas)

Session Chairs: Mariajose Castellanos, University of Maryland,
Baltimore County;
Derek Adams, Alexion Pharmaceuticals;
Kent Goklen, Merck;
David Klinke, West Virginia University;
John March, Cornell University;
Hari Pujar, Merck;
Marco Rito-Palomares, Tecnológico de Monterrey;
Joel Sirois, University of Sherbrooke

Monday, July 16, 2007

- 06:45 – 08:00 Breakfast Buffet (*L'Astral*)
- 08:00 – 09:30 **Mathematical and Systems Biology Analysis: From Molecules To Complex Networks** (*Suzor-Cote Krieghoff*)
Session Chairs: Christina Chan, Michigan State University
Yiannis Kaznessis, University of Minnesota
Peter Karp, SRI International
- 08:00 – 08:25 Costas Maranas, Pennsylvania State University
Metabolic model generation and automated curation: *Mycoplasma genitalium*
- 08:25 – 08:45 Jeff Gray, Johns Hopkins University
Computational structure prediction of therapeutic antibodies with their antigens
- 08:45 – 09:10 James Liao, University of California, Los Angeles
Chemogenomic deduction of nitric oxide targets and response network in *Escherichia coli*
- 09:10 – 09:30 Lars Nielsen, Australian Institute of Bioengineering and Nanotechnology
Hybrid algorithm for modeling stochastic regulatory network against a background of rapidly changing metabolite concentrations
- 09:30 – 10:30 **Plenary II** (*Suzor-Cote Krieghoff*)
Andrew Ellington, University of Texas
Protein engineering via feedback loops
- 10:30 – 11:00 Coffee Break (*Foyer 3^d*)
- 11:00 – 12:30 **Synthetic Biology and Metabolic Engineering** (*Suzor-Cote Krieghoff*)
Session Chairs: Mario Jolicoeur, Ecole Polytechnique, Montreal
Christina Smolke, California Institute of Technology
Timothy Dodge, Genencor
- 11:00 – 11:25 Jay Keasling, University of California, Berkeley
Engineering microbes for production of low-cost, effective, anti-malarial drugs
- 11:25 – 11:50 Sang Yup Lee, KAIST, Korea
Making systems biology work: Systems-level analysis and engineering of *Escherichia coli* for the production of L-valine
- 11:50 – 12:10 Francois Berthiaume, Shriners Hospital for Children
Multi-objective optimization of metabolic fluxes for bioartificial liver development
- 12:10 – 12:30 Peter Karp, SRI International
Metabolic network inference using pathway tools and MetaCyc
- 12:30 – 13:30 Lunch (*Place Montcalm + JP Lemieux*)

Monday, July 16, 2007 (continued)

13:30 – 15:00 Free Time

15:00 – 16:30 **Expression Platforms and Accelerating Process Development**

(*Suzor-Cote Krieghoff*)

Session Chairs: Lily Chu, Merck & Co.

Manon Cox, Protein Sciences

Alan Dickson, University of Manchester

15:00 – 15:22 Mark Leonard, Wyeth
The benefits of an integrated approach to cell line and platform process development

15:23 – 15:45 Wim Quax, University of Groningen
Exploring the *Bacillus* cell factory for secreting biopharmaceuticals

15:45 – 16:07 Timothy Dodge, Genencor
Trichoderma reesei as a fungal expression platform to accelerate process development

16:08 – 16:30 Anne Robinson, University of Delaware
Engineering approaches to membrane protein expression in yeast

16:30 – 17:00 Soda Break (*Foyer 3rd*)

17:00 – 18:30 **Parallel Sessions I**

Cell Engineering – Sponsored by Invitrogen (*Suzor-Cote*)

Session Chairs: Susan Sharfstein, Rensselaer Polytechnic Institute

Mohamed Al-Rubeai, University College Dublin

17:00 – 17:20 Stefanos Grammatikos, Boehringer Ingelheim
Optimization of mammalian cell systems for accelerated cell line and process development on the road to next-generation biopharmaceutical development and production

17:20 – 17:40 Jianguo Yang, MedImmune
Characterization of ER stress pathway genes for apoptosis of NS/O cell line using microarray and RNAi technologies

17:40 – 18:00 Say Kong Ng, Singapore-MIT Alliance
Application of destabilizing sequences on selection marker for improved recombinant protein productivity in CHO-DG44

18:00 – 18:15 Florence Wu, Invitrogen Bioservices
Deciphering the mechanism for tolerance to high osmolality

18:15 – 18:30 Susan Sharfstein, Rensselaer Polytechnic Institute
Sodium butyrate stimulates mAb over-expression in CHO cell by improving gene accessibility

Monday, July 16, 2007 (continued)

Data Based Modeling, Process Control and Analysis (*Krieghoff*)

Session Chairs: Naz Karim, Texas Tech University
Radhakrishnan Mahadevan, University of Toronto

- 17:00 – 17:10 Introductory Remarks
- 17:10 – 17:35 Robert Kiss, Genentech
Opportunities for applying PAT to biotech processes
- 17:35 – 18:00 Suzanne Farid, University College London
Reconciling multiple trade-offs and decisions in biopharmaceutical development
- 18:00 – 18:25 Reiner Luttmann, University of Applied Sciences, Hamburg, Germany
Applications of PAT – Process analytical technology for optimal production of active pharmaceutical ingredients in integrated bioprocesses
- 18:25 – 18:30 Concluding Remarks
- 18:30 – 20:00 Dinner (*Place Montcalm + JP Lemieux*)
- 20:00 – 22:30 **Poster Session B – Sponsored by Merck**
(*Leduc-Fortin-Morrice-Lismer, Pilot, Foyer, Foyer 3rd, Borduas*)

Tuesday, July 17, 2007

- 06:45 – 08:00 Breakfast Buffet (*L'Astral*)
- 08:00 – 09:15 **High Throughput and Omics Technologies** (*Suzor-Cote Krieghoff*)
Session Chairs: Mark Marten, University of Maryland, Baltimore County
Ken Reardon, Colorado State University
S. Patrick Walton, Michigan State University
- 08:00 – 08:25 Kelvin Lee, Cornell University
Improved secretion of heterologous protein via translation engineering
- 08:25 – 08:50 Paul Harris, Novozymes
Application of high-throughput technologies to the discovery of
lignocellulose-degrading proteins
- 08:50 – 09:15 William Bentley, University of Maryland, College Park
Biofunctionalization of prepackaged microfabricated devices: Spatio-
temporal-controlled assembly of biochemical pathways
- 09:15 – 10:15 **Plenary III** (*Suzor-Cote Krieghoff*)
Guy Sauvageau, Université de Montreal,
Institute for Research in Immunology and Cancer (IRIC)
Engineering blood stem cell expansion with recombinant HO_x proteins
- 10:15 – 10:45 Coffee Break (*Foyer 3^d*)
- 10:45 – 12:25 **The Biology-Chemistry Interface: Materials and
Bionanotechnology** (*Suzor-Cote Krieghoff*)
Session Chairs: Arthur Coury, Genzyme
James Henry, Louisiana State University
Junbae Kim, Pacific Northwest National Laboratory
- 10:45 – 11:10 Ravi Kane, Rensselaer Polytechnic University
The design of functional nanostructured materials
- 11:10 – 11:35 Wilfred Chen, University of California Riverside
Biological programmed synthesis of hybrid semiconductor nanocrystals
using *Escherichia coli* as a microbial factory
- 11:35 – 12:00 Douglas Clark, University of California Berkeley
Engineering extremophilic chaperones for biocatalysis and
bionanotechnology
- 12:00 – 12:25 Michael Shuler, Cornell University
Are orally ingested nanoparticles toxic? Development of a 'Body-on-a-
Chip' model
- 12:30 – 13:30 Lunch (*Place Montcalm + JP Lemieux*)
- 13:30 – 15:00 Free Time

Tuesday, July 17, 2007 (continued)

15:00 – 16:30

Parallel Sessions II

Vaccines (*Suzor-Cote*)

Session Chairs: Derek Adams, Alexion Pharmaceuticals
Dhinakar Kompala, University of Colorado, Boulder

15:00 – 15:05

Introductory remarks

15:05 – 15:25

Dane Wittrup, Massachusetts Institute of Technology
Controlling antigen cross-presentation kinetics in dendritic cells via yeast surface display engineering

15:25 – 15:45

Amine Kamen, Biotechnology Research Institute, Montreal
Improvements to the production of adeno-associated virus

15:45 – 16:05

Luis Maranga, MedImmune
Development of a platform process for cell culture production of a cold-adapted live attenuated influenza vaccine (LAIV)

16:05 – 16:25

Sibylle Herzer, GE Healthcare
Development of a chromatography medium for selective capture of influenza virus

16:25 – 16:30

Closing remarks

Analytics and Product Quality Studies in Biochemical Processes (*Krieghoff*)

Session Chairs: Francois Baneyx, University of Washington
Jerry Yang, Amgen

15:00 – 15:05

Introductory remarks

15:05 – 15:25

Kathy Carswell, Genentech
Approach to post-market yield improvements for biologics while maintaining product quality attributes

15:25 – 15:45

Jifeng Zhang, Amgen
Impact of cell culture medium on recombinant protein quality

15:45 – 16:05

Chris Roberts, University of Delaware
Monitoring and interpreting nonnative aggregation and its kinetics

16:05 – 16:25

Alain Garnier, Laval University
LCMS/Multivariate analysis of whole proteins and cell culture samples for bioprocess monitoring

16:25 – 16:30

Closing remarks

16:30 – 17:00

Soda Break (*Foyer 3rd*)

Tuesday, July 17, 2007 (continued)

17:00 – 18:30

Parallel Sessions III

Biochemical Engineering Education (*Suzor-Cote*)

Session Chairs: Matt Croughan, Keck Graduate Institute
Gene Schaefer, Bristol Myers Squibb

17:00 – 17:10

Introductory remarks

17:10 – 17:30

Terry Papoutsakis, University of Delaware
Biochemical engineering for the 21st Century

17:30 – 17:50

Claire Komives, San Jose State University
BioX for all: no chemical engineering student left behind

17:50 – 18:10

Robert Kelly, North Carolina State University
Interdisciplinary training of engineers and scientists in the laboratory components of molecular biotechnology at North Carolina State University

18:10 – 18:30

Panel and audience discussion

Biochemical Engineering of Product Formulation, (In)Stability, and Preservation – Sponsored by Amgen (*Krieghoff*)

Session Chairs: Chris Roberts, University of Delaware
Richard Remmele, Amgen
Carl Burke, Merck

17:00 – 17:20

John Beals, Eli Lilly
The role of protein optimization in improving the pharmaceutical properties of biotherapeutic candidates: A discovery-based focus to stability relevant to development and commercialization

17:20 – 17:40

Andreas Bommarius, Georgia Institute of Technology
Predicting protein stability of therapeutics and biocatalysts in aqueous salt solutions

17:40 – 18:00

Ranjini Ramachander, Amgen
Biophysical characterization for manufacturability assessments for early stage candidate screenings

18:00 – 18:30

Panel and audience discussion

18:30 – 20:00

Poster Session A – Sponsored by Merck

(*Leduc-Fortin-Morrice-Lismer, Pilot, Foyer, Foyer 3rd, Borduas*)
(Poster room will be open all evening)

20:00 –

Dinner on-your-own

Wednesday, July 18, 2007

- 06:45 – 08:00 Breakfast Buffet (*L'Astral*)
- 08:00 – 09:30 **Biomolecular Transformations and Biocatalysis**
Session Chairs: Patrick Cirino, Pennsylvania State University
James Lalonde, Codexis
Poonam Singh, University of Ulster
- 08:00 – 08:25 Jeroen Hugenholtz, Kluyver Centre, Netherlands
Zero growth product formation in industrial micro-organisms
- 08:25 – 08:50 Lori Giver, Codexis
Green manufacture of chiral alcohols using custom evolved biocatalysts
- 08:50 – 09:10 Huimin Zhao, University of Illinois
Biosynthesis of xylitol from renewable biomass
- 09:10 – 09:30 Ramon Gonzalez, Rice University
A new paradigm for glycerol fermentation in *Escherichia coli* and other enteric bacteria: Implications for the production of biofuels and biochemicals
- 09:30 - 10:30 **Plenary IV: (Suzor-Cote Krieghoff)**
David Robinson, Merck
Challenges and opportunities for enzyme, cell line and drug delivery engineering
- 10:30 – 11:00 Coffee Break (*Foyer 3rd*)
- 11:00 – 12:30 **Bioenergy (Suzor-Cote Krieghoff)**
Session Chairs: Jim McMillan, National Renewable Energy Laboratory
Jonathan Mielenz, Oak Ridge National Laboratory
Percival Zhang, Virginia Polytechnic Institute and State University
- 11:00 – 11:25 Lee Lynd, Dartmouth College
Energy biotechnology
- 11:25 – 11:50 Ziyad Rahme, Iogen
Scale-up of ethanol production from wheat straw
- 11:50 – 12:15 Timothy Tschaplinski, Oak Ridge National Laboratory
Accelerated domestication of *Populus* for bioenergy production
- 12:15 – 12:35 Friedrich Sreenc, University of Minnesota
Automated flow cytometry for rapid strain development
- 12:35 – 13:00 Lunch (*Place Montcalm*)
or pick up of pre-ordered boxed lunches (*Foyer 3rd*)
- 13:00 – 15:00 Optional Excursions
- 16:00 – 16:30 Soda Break (*Foyer 3rd*)

Thursday, July, 19, 2007

- 06:45 – 08:00 Breakfast Buffet (*L'Astral*)
- 08:00 – 10:00 **Complex Biological Systems – Tissue, Multicellular Organisms, and Microbial Communities** (*Suzor-Cote Krieghoff*)
Session Chairs: Julian Chaudhuri, University of Bath
Bill Miller, Northwestern University
- 08:00 – 08:25 David Schaffer, University of California, Berkeley
Engineering novel synthetic systems for stem cell control
- 08:25 – 08:45 Balaji Rao, North Carolina State University
Quantitative analysis and control of human embryonic stem cell microenvironment
- 08:45 – 09:10 Robert Kelly, North Carolina State University
Functional genomics approaches for examining intra- and inter-species interactions in microbial communities
- 09:10 – 09:30 Udo Reichl, Otto-von-Guericke-University, Germany
A medically relevant three-species mixed culture in a chemostat:
Mathematical modeling and experiments to study interaction effects
- 09:30 – 09:50 Neil Forbes, University of Massachusetts, Amherst
Engineered strategies to overcome therapeutic resistance in solid tumors
- 10:00 – 10:30 Biochem XVI with Coffee (*Suzor-Cote Krieghoff*)
- 10:30 – 11:00 Concluding Remarks (*Suzor-Cote Krieghoff*)
- 11:00 Pick-up Boxed Lunch/Departure (*Foyer 3rd*)