

# BIOT

## DIVISION OF BIOCHEMICAL TECHNOLOGY

**Final Program, 225th ACS National Meeting, New Orleans, LA, March 23-27, 2003**

M. R. Marten and J. L. Coffman, *Program Chairs*

### OTHER SYMPOSIA OF INTEREST:

**Gene-Based Medicine: Delivery and Diagnostics** (see *Division of Polymeric Materials: Science and Engineering*, Tue)

**New Concepts in Biomaterials: Synthesis, Application, Concerns** (see *Division of Polymeric Materials: Science and Engineering*, Sun, Mon)

**Polymeric Surface Modification: Biomedical Applications** (see *Division of Polymer Chemistry*, Sun, Mon)

**Polymeric Surface Modification: Biomedical Applications** (see *Division of Polymer Chemistry*, Sun)

**MALDI and ESI Mass Spectrometry Techniques for Polymers** (see *Division of Polymeric Materials: Science and Engineering*, Sun, Mon)

**Macromolecules to Bioparticles: Analyses with Field-Flow Fractionation** (see *Division of Analytical Chemistry*, Mon)

**Adsorption of Macromolecules at Liquid-Solid Interfaces** (see *Division of Colloid and Surface Chemistry*, Sun, Mon, Tue)

**Biological Applications of Implicit Solvent Models** (see *Division of Computers in Chemistry*, Mon, Wed, Thu)

**Microscale Biosensors for Environmental Monitoring** (see *Division of Environmental Chemistry*, Mon)

**Biological Applications of Nanomaterials and Nanotechnology (sponsored by Advanced Materials & Nanotechnology Subdivision)** (see *Division of Industrial and Engineering Chemistry*, Wed, Thu)

**Informatics Challenges in Pharmacogenomics** (see *Biotechnology Secretariat*, Wed)

**Processes for Utilization of Agricultural By-Products** (see *Division of Agricultural & Food Chemistry*, Wed, Thu)

### SOCIAL EVENTS:

**Annual BIOT Reception:** Sun

**BIOT Business Meeting:** Wed

**BIOT Future Programming Meeting:** Tue

**Poster Session:** Wed

## SUNDAY MORNING

## Section A

Convention Center -- Room 293

**Collection, Analysis, and Use of Process Data**

D. E. Block and V. Goetz, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**1.** Managing and analyzing bioprocess manufacturing data for process troubleshooting, statistical quality control, and regulatory submissions. **S. Illich**, N. Gerrior, P. Werth

**8:30** —**2.** Critical assessment on the analysis of batch fermentation databases. **C. Undey**, A. Cinar

**8:55** —**3.** On-line monitoring of bioprocesses using multiwavelength fluorescence. **A. Eliasson**, M. Haack, L. Olsson

**9:20** —**4.** Identifying key variables for cell culture process data analysis utilizing principal component analysis and basis transformation. **S. Kaneshiro**, T. Monica, R. Kiss

**9:45** — Intermission.

**10:05** —**5.** Retrospective time-dependent optimization of recombinant *E. coli* fermentations using historical data and hybrid neural network models. **M. C. Coleman**, D. E. Block

**10:30** —**6.** Use of statistical experimental design methods in developing a high-concentration liquid formulation for a monoclonal antibody. **E. Kaisheva**

**10:55** —**7.** Integrated process optimization for bioparticle production. P. E. Cruz, A. Bengala, L. Maranga, **M. J. T. Carrondo**

## Section B

Convention Center -- Room 294

**Advances in Formulation**

S. Sagar and E. J. Fernandez, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**8.** Correlation of physical and chemical stability of rhDNase with melting temperature. **M. E. M. Cromwell**, T. Patapoff, S. J. Shire

**8:25** —**9.** Development of a stable parenteral formulation for *Pemphigus vulgaris* tolerizing peptide (PI-0824). **J. Ghiorse**, L. Waldmann, A. Trischitta, T. Sawyer, E. Clark

**8:45** —**10.** Characterization of albutropin fusion protein: A novel, long-acting form of human growth hormone. **A. M. Wilcox**

**9:05 —11.** Stabilization of an oral rotavirus vaccine. **C. Burke**

**9:25 —12.** Designing an in vitro cell cell culture model to predict drug pharmacokinetics and stability. **S. F. Khattak, S. C. Roberts**

**9:45 —** Intermission.

**10:10 —13.** Characterization of a novel adjuvant/delivery system for plasmid DNA vaccines. **R. K. Evans, H. Mach, D. Zhu, R. D. Troutman, D. R. Casimiro, S. Chin, S. Wu, C. Ahn, D. K. Nawrocki, L. A. Isopi, D. M. Williams, D. B. Volkin, J. W. Shiver**

**10:30 —14.** Sterilizing filtration of plasmid DNA: Effects of plasmid molecular weight and conformation. **M. P. Watson, D. Boyd, J. C. Murphy, S. Sagar, R. K. Evans, A. L. Lee, M. Winters**

**10:50 —15.** Effects of formulation components on the corrosion of 316L stainless steel. **P. Lam, R. Keck, S. Lo, R. Wong, C. Hsu**

Section C

Convention Center -- Room 295

### **Environmental Biotechnology**

T. K. Wood and K. F. Reardon, *Organizers*

**8:00 —** Introductory Remarks.

**8:05 —16.** Enhanced solubility of TCE and other contaminants due to the presence of biological material. **J. W. Barton, S. A. Jones, C. Vodraska, B. H. Davison**

**8:25 —17.** Use of fluorinated analogs to explore pollutant fate in plant systems. **J. M. Tront, F. M. Saunders**

**8:45 —18.** Enzymatic treatment of phenol with crude fungal peroxidase from *Coprinus* species. **K. Ikehata, I. D. Buchanan, D. W. Smith**

**9:05 —19.** Microbial identification using "signature probes". **M. Larios-Sanz, K. D. Kourentzi, G. E. Fox, R. C. Willson**

**9:25 —20.** An alternative ecological approach to process control optimization for bioprocesses operated with mixed microbial populations. **P. E. Saikaly, D. B. Oerther**

**9:45 —** Intermission.

**10:05 —21.** Detoxification of organophosphates by immobilized dual functional biocatalyst in a cellulose hollow fiber bioreactor. **A. A. Wang, W. Chen, A. Mulchandani**

**10:25 —22.** Two-phase partitioning bioreactors: A new paradigm for xenobiotics destruction in air, water, and soil. **A. J. Daugulis, B. G. Amsden**

**10:45 —23.** Influence of CO<sub>2</sub> concentration in air on algae respiration in membrane bioreactor. **L. M. Cao, H. L. Chen, C. Y. Gao, L. H. Cheng, J. Y. Feng**

## Polymeric Surface Modification: Biomedical Applications

*Cosponsored with Division of Polymer Chemistry*

### SUNDAY AFTERNOON

Section A

Convention Center -- Room 293

#### Advances in Expression Systems

A. S. Robinson and N. Fong, *Organizers*

**1:30** — Introductory Remarks.

**1:35 —24.** Mimicking the cytoplasmic environment of *Escherichia coli* with cell-free protein synthesis activates oxidative phosphorylation. **M. C. Jewett**, J. R. Swartz

**1:55 —25.** Cell-free protein synthesis utilizing unnatural amino acids. **J. Schulte**, J. R. Swartz

**2:15 —26.** Export of correctly folded antibodies from the cytoplasm of *Escherichia coli* via the twin-arginine translocator. **M. P. DeLisa**, D. Tullman, G. Georgiou

**2:35 —27.** NusA fusion protein expression and purification in conventional and high-throughput applications. A. Grabski, M. M. Mehler, K. W. Yaeger, K. Novy Jr., G. D. Davis, **R. G. Harrison**

**2:55 —28.** Engineering yeast for high-level expression of G-protein coupled receptors. **A. S. Robinson**, R. T. Niebauer, J. Butz

**3:15** — Intermission.

**29.** Withdrawn.

**3:45 —30.** Modification of the *N*-glycosylation pathway of lower eukaryotes to a mammalian type. **R. H. Contreras**, W. Vervecken, N. Callewaert, S. Geysens, V. Kaigorodov

**4:05 —31.** Expression of human antibodies for clinical supply using myeloma cells. **L. Daramola**, R. Field

Section B

Convention Center -- Room 294

#### Advances in Protein Folding, Aggregation, and Modification

T. Good and A. M. Tsai, *Organizers*

**1:30** — Introductory Remarks.

**1:35 —32.** Effect of secondary structure on protein aggregation: A replica exchange on-lattice simulation. **D.**

**Bratko, H. W. Blanch**

**1:55 —33.** Critical role of hydration in enzyme activity in organic solutions. **L. Yang, J. S. Dordick, S. Garde**

**2:15 —34.** Protein folding and proton binding are linked: Analysis by capillary electrophoresis and electrokinetic models of colloids. **J. D. Carbeck**

**2:35 —35.** Aggregation during refolding is dependent on the second virial coefficient. J. G. S. Ho, **A. P. J. Middelberg**

**2:55 —36.** Strategies for modulating aggregation kinetics of amyloid-forming peptides. **R. M. Murphy, J. R. Kim, T. J. Gibson, L. L. Kiessling**

**3:15 —** Intermission.

**3:25 —37.** Multiple active forms of single-chain antibody: Characterization and folding pathway analysis. **A. S. Robinson, J. R. Sinacola**

**3:45 —38.** Structure, function, and engineering of bacterial disulfide isomerases for enhancing heterologous protein expression. **L. Segatori, G. Georgiou**

**4:05 —39.** Exploring the dimer interface as element of kinetic stability in a bacterial starch phosphorylase. **B. Nidetzky, R. Griessler, A. Schwarz, F. Tanfani, A. Scire**

**4:25 —40.** Analysis of cross-linking hemoglobins using variable-length reagents. **E. Tarasov, K. M. Bobofchak, G. S. Gawlak, K. P. Normoyle, R. M. Danner, K. W. Olsen**

Section C

Convention Center -- Room 295

## **Bioprocess Monitoring and Control**

C. F. Komives and H. Lam, *Organizers*

**1:30 —** Introductory Remarks.

**1:35 —41.** Application of the focused beam reflectance measurement method to the characterization of plant cells in suspension culture. **P. T. Jeffers, S. Raposo, M. E. Lima-Costa, P. Kieran, B. Glennon**

**1:55 —42.** Growth sensitivity of microbial populations in mixed cultures is determined by a new microrespirometry method. **P. G. Stroot, D. B. Oerther**

**2:15 —43.** On-line viable cell monitoring during long-term microcarrier cultures. **F. Jimenez-Marrero, L. Bonnarens, J. L. Barker, J. E. Fleury, M. A. Forbes, R. N. Pattison, C. W. Buser, C. Hwang**

**2:35 —44.** On-line biomass monitoring with scanning dielectric spectroscopy. **C. M. Cannizzaro, S. Valentinotti, I. W. Marison, U. von Stockar**

**2:55 —45.** A mechanism for glucose pH control. **M. A. Alexander, J. G. Hoogerheide, C. M. Campbell**

**3:15** — Intermission.

**3:35** —**46.** Novel sensors for cell culture and fermentation. G. Rao, **X. Ge**, Y. Kostov, L. Tolosa

**3:55** —**47.** Adaptive control of a *G. xylinus* fed-batch fermentation using in situ mid-IR spectroscopy. **H. Kornmann**, S. Valentinotti, M. H. Rhiel, U. von Stockar

**4:15** —**48.** Real-time fault detection, diagnosis, and quality prediction in batch fermentations. **C. Undey**, S. Ertunc, E. Tatara, A. Cinar

## **Polymeric Surface Modification: Biomedical Applications**

### **Tutorial**

*Cosponsored with Division of Polymer Chemistry*

## **SUNDAY EVENING**

Section A

Convention Center -- Room 293

### **David Perlman Memorial Lecture**

M. R. Marten, *Presiding*

**5:00** —**49.** Title to be announced. **T. To Be Announced**

## **Polymeric Surface Modification: Biomedical Applications**

*Cosponsored with Division of Polymer Chemistry*

## **MONDAY MORNING**

Section A

Convention Center -- Room 293

### **Advances in Polypeptide Production Technology: Accelerating Product and Process Development**

H. Meerman and J. Li, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**50.** Accelerating product and process development by using cell-free protein synthesis. **J. R. Swartz**, N. Michelle-Reydellet, K. Knapp, G. Yin, J. Yang

- 8:30 —51.** Enhancement of antibody fragments expression in *Escherichia coli*: A novel cytoplasmic screening approach. **R. Levy**, B. Iverson, G. Georgiou
- 8:55 —52.** Engineering fungal systems to produce human glycoproteins. **T. Gerngross**
- 9:20 —53.** Overexpression of industrial enzymes in *Pichia pastoris*. **J. Li**, T. Kaneko, C. Isaac, N. Palackal, J. Wei, J. Sun, B. Steer, A. Vasavada
- 9:45 —** Intermission.
- 10:00 —54.** Simulation of large-scale environments in the laboratory. **T. Dodge**, P. Lundqvist
- 10:25 —55.** Oxidative stress responses in *E. coli* fermentations under controlled conditions. C. Lu, W. E. Bentley, H. J. Cha, J. Garcia, **G. Rao**
- 10:50 —56.** Accelerating development of mammalian cell bioprocesses for recombinant protein production. **C. Goudar**, R. Heidemann, J. Michaels, K. Konstantinov

Section B

Convention Center -- Room 294

**Therapeutic Antibody Issues: Fundamentals and Production Processes**S. Lee and E. J. Fernandez, *Organizers*

- 8:00 —** Introductory Remarks.
- 8:05 —57.** Challenges of securing biologics capacity. **E. Bramhall**, S. S. Lee, J. Tabor
- 8:30 —58.** Development of a robust fed-batch CHO cell culture platform to optimize monoclonal antibody production. **P. A. Garza**, C. Kopelev, D. Osborne, M. Reid, J. Torres, M. Gaya, N. Vargas, W. Noe, Y. H. D. Chang
- 8:55 —59.** Improved process yields in monoclonal antibody manufacture. **A. E. Schmelzer**, S. White, E. Tsao, A. Varma
- 9:20 —60.** The role of process simulation in the development, evaluation, and debottlenecking of monoclonal antibody production processes. **C. Siletti**, D. Petrides
- 9:45 —** Intermission.
- 10:00 —61.** Characterization of a small molecule conjugated antibody. **W. Zhang**
- 10:25 —62.** Development of high-performance IDEC's in-house medium for antibody production. **Y. Huang**, T. Huynh, L. Ly, W. Noé, Y. H. D. Chang
- 10:50 —63.** Impacts of glycosylation on antibody effector function. **V. Sarantschin**
- 11:15 —** Panel Discussion.

## Section C

Convention Center -- Room 295

### Evaluation of Column Performance in Preparative Chromatography

*Cosponsored with Division of Analytical Chemistry*

J. Thömmes and T. M. Larson, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**64.** How can you tell if a column is doing its job? **E. N. Lightfoot**

**8:35** —**65.** Monitoring, diagnosis, and troubleshooting of large-scale chromatography. **J. Prior**, M. Menon, C. Dugopolski, K. Legg

**8:55** —**66.** Packing quality and integrity of industrial chromatography columns: From raw data smoothing to performance correlations. **A. Sonnenfeld**, H. Forrester, J. Thommes

**9:15** —**67.** Determination of the parameters governing biomolecule transport in EDTPA-modified zirconia particles. **A. Subramanian**, S. Sarkar, P. W. Carr

**9:35** —**68.** Chemometric analysis of chromatography production data: Integrating principal component analysis into a highly regulated industry. **M. M. Mostajo**, T. M. Larson, J. O. Davis

**9:55** — Intermission.

**10:10** —**69.** Resin reuse validation and evaluation of performance over resin lifetime. **T. S. Taggart**, D. J. Dripps, T. Kessler, M. E. Cameron, J. E. Seely, R. J. Todd

**10:30** —**70.** Evaluation of algorithms for quantification of packed-bed integrity in production-scale chromatography. **J. O. Davis**, T. M. Larson, R. Arnold

**10:50** —**71.** Tracking resin dynamic capacity in preparative chromatography. **R. S. Blackmore**, J. R. Ryland

## Section D

Convention Center -- Room 296

### 2002 Industrial Biotechnology Awards Presentation and Lecture

M. R. Marten, *Presiding*

**11:40** —**72.** Title to be announced. **T. To Be Announced**

### Polymeric Surface Modification: Biomedical Applications

*Cosponsored with Division of Polymer Chemistry*

**MONDAY AFTERNOON**

## Section A

Convention Center -- Room 293

### Advances in Fermentation Process Development

Z. J. Li and I. Blumentals, *Organizers*

**2:00** — Introductory Remarks.

**2:05** —**73.** Seed train development for production of HIV gag plasmid in *E. coli*. **J. L. Okonkowski**, R. Greasham, M. Chartrain

**2:30** —**74.** Integrated systems approach for the optimization of recombinant fermentation processes. **K. Bayer**, M. Cserjan, G. Striedner, K. Duerrschmid, H. Reischer, F. Clementschitsch

**2:55** —**75.** Process development by CFD modeling for very large-scale fermentations: Development of yeast kinetics for batch processes. **C. G. Hébert**, C. E. Wyman, L. R. Lynd, A. Bakker

**3:20** —**76.** Monitoring cell populations in bioreactors. **J. Kacmar**, N. Vijayasankaran, F. Srienc

**3:45** — Intermission.

**4:10** —**77.** Production of novel triketide lactone analogs by directed biosynthesis. **R. Regentin**, J. Kennedy, N. Wu, J. Galazzo, P. Licari, R. Desai

**4:35** —**78.** Enhanced protein production by *Bacillus subtilis* using a dual exponential feeding strategy. H. Huang, D. Ridgway, **T. Gu**, M. Moo-Young

**5:00** —**79.** Improvement in oxygen transfer in submerged fermentation using microbubbles. J. Weber, **F. Agblevor**

**5:25** —**80.** Development and scale-up of *Pichia pastoris* fermentation and protein recovery processes. **D. B. Rudolph**, T. Powers, R. Land, S. Pittinger, D. R. Durham

## Section B

Convention Center -- Room 294

### Therapeutic Antibody Issues: Fundamentals and Production Processes

S. Lee and E. J. Fernandez, *Organizers*

**2:00** — Introductory Remarks.

**2:05** —**81.** Effects of anti-apoptosis genes on mammalian cells producing antibodies. B. Figueroa Jr., E. Ailor, M. Reff, J. M. Hardwick, **M. J. Betenbaugh**

**2:25** —**82.** Production of proteins with complex glycosylation in insect cells. **C. E. Joosten**, M. L. Shuler

**2:45** —**83.** Analysis of metabolic decline in batch/fed-batch hybridoma cultures. **R. R. Balcarcel**, L. M. Clark

**3:05 —84.** Production of antibodies and antibody fragments in *Aspergillus niger*. **H. J. Meerman**, H. Wang, C. Lin, D. Victoria, M. Ang, J. Pucci, M. Heng, X. Wang, R. Fong, B. Fox, B. Fryksdale, D. Wong, M. Ward

**3:25 —85.** Engineered antibodies to treat whooping cough. **J. Maynard**, D. Relman, B. Iverson, T. Merkel, G. Georgiou

**3:45 —** Intermission.

**4:05 —86.** Toward production of therapeutic antibodies with mammalian-type glycosylation in fungal systems. **S. Wildt**

**4:25 —87.** Evaluation of a continuous disc stack centrifuge for the clarification of mammalian cell cultures. **R. Shpritzer**

**4:45 —88.** CE: A rapid analysis tool and an emerging technology. **D. L. Beurer**, D. J. Roush, K. E. Goklen

**5:05 —** Discussion.

Section C

Convention Center -- Room 295

### **Advances in Chromatography**

*Cosponsored with Division of Analytical Chemistry*

A. K. Velayudhan and A. S. Rathore, *Organizers*

**2:00 —** Introductory Remarks.

**2:05 —89.** Chromatography of ultralarge proteins and nanoparticles using monoliths. **A. Jungbauer**, A. Zochling, R. Hahn

**2:25 —90.** Stimulus-responsive polymers used in chromatographic separation. **R. Palmgren**, J. Van Alstine, A. Rudstedt, A. Kjellgren, M. Wulff

**2:45 —91.** Protein and stationary-phase determinants of FGF retention on cation exchangers. **A. Lehnoff**, P. DePhillips, Y. Yao

**3:05 —92.** Modeling of breakthrough curves of staphylococcal enterotoxin B in peptide affinity chromatography. **G. Wang**, R. G. Carbonell

**3:25 —93.** Strategies for maintaining chromatographic column performance across scales. **A. Williams**, K. Taylor, K. Dambuleff, R. Kennedy

**3:45 —** Intermission.

**4:15 —94.** Purification of plasmid DNA on a novel matrix using ion-pair chromatography. **J. Curling**, M. Chambers, L. Smiley, A. Whan, D. Baines

**4:35 —95.** Qualification of large-scale chromatography systems. **O. Kaltenbrunner**, A. Stokelman

**4:55 —96.** Novel software tools for evaluating integration within a downstream process: A case study of

expanded-bed adsorption vs packed-bed adsorption. **M. A. Mustafa**, J. Washbrook, S. Farid, A. C. Lim, N. Titchener-Hooker

Section D

Convention Center -- Room 296

### Novel Bioanalyses Using Lab-on-a-Chip Technologies

*Cosponsored with Division of Analytical Chemistry*

D. M. Spence and R. S. Martin, *Organizers*

**2:00** — Introductory Remarks.

**2:05** —**97.** Biomediated assembly of functionalized microbeads for capture of microorganisms. **T. T. Huang**, T. Geng, D. Akin, W. Chang, J. Sturgis, R. Bashir, A. K. Bhunia, J. P. Robinson, M. R. Ladisch

**2:25** —**98.** Biomembranes on a microfluidic chip. **P. Cremer**

**2:55** —**99.** Development of a biomimetic circulatory system using chips fabricated from PDMS. **D. J. Fischer**, N. J. Torrence, D. M. Spence

**3:15** —**100.** Microfluidic devices for complex sample analysis: Integrated on-chip sample preparation, cellular, and chemical analysis starting from raw samples. **B. H. Weigl**

**3:45** — Intermission.

**4:05** —**101.** Polymer-based microfluidic devices for PCR amplification of genomic DNA. **S. A. Soper**, R. L. McCarley, M. C. Murphy

**4:35** —**102.** Microreactors without microfabrication: Using microscale steady-state kinetic analysis to study biological interactions. **N. J. Gleason**, J. D. Carbeck

**4:55** —**103.** Microfluidic sensors for protein analyses. **G. Thomas**, M. J. Tarlov

### MONDAY EVENING

Section A

Convention Center -- Hall G

### Sci-Mix Poster Session

Z. J. Li, *Organizer*

**8:00 - 10:00**

223-224, 226, 229-230, 232, 234, 242, 244-245, 253, 255, 258, 260, 262-266, 268-269, 275, 279, 285, 287, 290, 293, 296, 300, 302, 304, 311, 315, 325-328, 331-332, 335. See subsequent listings.

### TUESDAY MORNING

## Section A

Convention Center -- Room 293

**Bioinformatics, Genomics, and Proteomics**

V. Hatzimanikatis and W. Zhang, *Organizers*

**8:00** — Introductory Remarks.

**8:20** —**104.** Metabolic flux analysis based on dynamic genomic information. **K. San**, S. Cox, G. N. Bennett

**8:40** —**105.** Metabolite and protein profiling of whole cells using soft-ionization mass spectrometry for rapid microbial characterization. **S. Vaidyanathan**, R. Goodacre

**9:00** —**106.** Dynamic modeling of the *Escherichia coli* phosphoenolpyruvate-glycose phosphotransferase system. **P. Prakash**, J. S. Edwards

**9:20** —**107.** Transcriptome analysis of ethanologenic *Escherichia coli* strains: Tolerance to ethanol. **R. Gonzalez**, H. Tao, K. T. Shanmugam, L. O. Ingram

**9:40** — Intermission.

**9:55** —**108.** A functional proteomics study in neurobiology and the elucidation of signal transduction pathways. **W. D. Mo**

**10:15** —**109.** Glycoside hydrolases from *Thermotoga maritima*: Physiological and biotechnological aspects. **S. R. Chhabra**, K. R. Shockley, S. B. Connors, K. Scott, R. D. Wolfinger, R. M. Kelly

**10:35** —**110.** Protein classification by ligand binding. **M. Farnum**, S. Izrailev

**10:55** —**111.** A computational framework for the discovery of novel biotransformations. **V. Hatzimanikatis**, C. Li, J. A. Ionita, L. J. Broadbelt

## Section B

Convention Center -- Room 294

**Advances in Bioseparations**

A. A. Shukla and M. R. Etzel, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**112.** Biofunctional membranes for *Listeria monocytogenes* detection. **W. Chen**, M. R. Ladisch, T. Geng, A. K. Bhunia

**8:25** —**113.** Enhanced ultrafiltration: Using electrostatic repulsion to increase yield and throughput. **G. Bolton**, R. Kuriyel, S. Pearl

**8:45** —**114.** Optimization of an osmotic shock procedure for isolation of a protein product expressed in *E. coli*.

**A. S. Rathore**, R. E. Billbrey, D. E. Steinmeyer

**9:05 —115.** Purification of a polysaccharide conjugate vaccine using microfiltration membrane in backpulsing mode. **E. P. Wen**, L. D. D'Silva, D. Murray, S. L. Sagar, A. L. Lee

**9:25 —116.** Membrane adsorber technology for trace impurity removal applications. **M. W. Phillips**, H. Lutz

**9:45 —** Intermission.

**10:15 —117.** Membrane adsorber process optimization through design of experiments. **J. Pieracci**, C. Schiffner, J. Thommes, L. E. Conley

**10:35 —118.** Strategies for optimizing the robustness of viral filtration steps in large-scale biopharmaceutical manufacturing processes. **R. Caren**

**10:55 —119.** Strategies for improving mammalian cell clarification performance. **S. Abraham**, N. Bingham, K. Green, J. Kenworthy

Section C

Convention Center -- Room 297

### **Advances in Vaccine Development, Gene Delivery, and Gene Therapy**

W. Zhou, W. W. Q. Sun, and P. C. Fusco, *Organizers*

**8:00 —** Introductory Remarks.

**8:05 —120.** Development and characterization of an improved adenoviral gene therapy manufacturing process. **C. K. Murphy**, J. M. Keegan, D. McNeilly

**8:30 —121.** Charged poly(lactide-*co*-glycolide) microparticles can effectively deliver proteins and DNA in vaccines. **J. D. Chesko**, J. Kazzaz, M. Ugozzoli, M. Singh, D. O'Hagan

**8:55 —122.** Developing an AAV-based vaccine for HIV-1. **B. A. Thorne**

**9:20 —123.** High-titer production of retroviral vector with suspension-adapted 293GPG cells. **A. Garnier**, K. Ghani, P. Trudel, A. Kamen

**9:45 —** Intermission.

**10:05 —124.** Protection against anthrax toxin by heteropolymers directed against protective antigen. **R. Mabry**, C. Maassen, N. Mohamed, K. Brasky, J. Pattersen, G. Spitalny, L. Casey, B. L. Iverson, G. Georgiou

**10:30 —125.** Quantitative comparison of nonviral gene delivery vectors: Model analysis of intracellular trafficking events. **C. M. Varga**, R. Langer, D. A. Lauffenburger

**10:55 —126.** Development of a manufacturing process for a cell culture-derived smallpox vaccine. **F. Wu**, G. Seaney, R. Kiefer, J. Marshall, S. Kodihalli, J. Gilly, D. Fine, D. Clanton

Section D

Convention Center -- Room 295

**Marvin J. Johnson Award Presentations and Lecture**

M. R. Marten, *Presiding*

**11:40 —127.** De novo design of protein secretion pathways for profit and for fun. **G. Georgiou**

**TUESDAY AFTERNOON**

Section A

Convention Center -- Room 293

**Bioinformatics, Genomics, and Proteomics**

V. Hatzimanikatis and W. Zhang, *Organizers*

**2:00** — Introductory Remarks.

**2:20 —128.** Predicting operon and regulon structure in *Archaeoglobus fulgidus* using transcriptomic data. **L. Rohlin**, C. Sabatti, J. C. Liao

**2:40 —129.** Genome-wide analysis of protein export via the Tat pathway in *Escherichia coli*. **D. Tullman**, M. P. DeLisa, Y. Kawarasaki, G. Georgiou

**3:00 —130.** Global effects of oxygen exposure during recombinant protein production in *Escherichia coli*. **W. B. Perry**, C. L. Cooney

**3:20 —131.** Analysis of mRNA and protein expression in *Escherichia coli*. **K. H. Lee**, P. S. Lee

**3:40** — Intermission.

**4:10 —132.** Proteomic analysis of metabolic changes in fed-batch CHO cell cultures. **D. E. Pascoe**, D. Arnott, W. M. Miller, E. T. Papoutsakis, D. C. Andersen

**4:30 —133.** Metabolic and evolutionary engineering in the era of genomics: Antibiotic resistance as a model for engineering new microbial behaviors. **R. T. Gill**, S. Copley, M. Lynch

**4:50 —134.** Functional genomics in tissue engineering: Gene expression profile of engineered skin equivalents subjected to barrier disruption. **S. T. Andreadis**, P. Koria, D. Brazeau, P. Hayden

**5:10 —135.** Pattern discovery as a generic tool for the analysis of biological data. **K. Jensen**, G. N. Stephanopoulos

Section B

Convention Center -- Room 294

**Advances in Bioseparations**

M. R. Etzel and A. A. Shukla, *Organizers*

**2:00** — Introductory Remarks.

**2:05** —**136.** Comparison of strong cation-exchange resins for protein purification. **A. Staby**, I. H. Jensen, U. Bruus, M. Sand, R. G. Hansen, J. H. Jacobsen

**2:25** —**137.** New chromatofocusing methods in biotechnology. **D. Frey**, X. Kang, H. Shen

**2:45** —**138.** Practical aspects of large-scale protein crystallization. **M. Heng**

**3:05** —**139.** Effect of support characteristics on the performance of protein A chromatography media. **J. T. McCue**, I. Quiñones-Garcia, G. Kemp, D. Low

**3:25** —**140.** Efficiency of expanded-bed adsorption processes. **R. A. Hjorth**

**3:45** — Intermission.

**4:15** —**141.** Multiobjective optimization strategies for preparative chromatography. **D. Nagrath**, A. Messac, B. W. Bequette, S. M. Cramer

**4:35** —**142.** Salt effects on protein RPC retention and conformation. E. J. Fernandez, **J. M. Sokol**, J. O'Connell

**4:55** —**143.** Microcalorimetry study of the interactions between poly(*N*-isopropylacrylamide) microgels and amino acids. **H. Bianco-Peled**, O. Kimhi

Section C

Convention Center -- Room 297

### **Advances in Vaccine Development, Gene Delivery, and Gene Therapy**

W. Zhou and W. W. Q. Sun, *Organizers*

**2:00** — Introductory Remarks.

**2:05** —**144.** Live, oral, attenuated *Salmonella typhi* vaccine strains as carriers of heterologous antigens. **E. M. Barry**, A. Santiago, M. M. Levine

**2:25** —**145.** Toll-4 dependent adjuvant activity of emulsan. **B. Panilaitis**, L. Glickstein, J. Fuhrman, D. L. Kaplan

**2:45** —**146.** Antibody responses to encapsulated group C meningococcal polysaccharide-tetanus toxoid conjugates. **C. E. Frasch**, C. Lee, J. Zhang

**3:05** —**147.** Antigen-specific molecular sizing of a multivalent capsular polysaccharide vaccine by modern size-exclusion chromatography and nephelometry. Y. Yang, A. Matukonis, H. Hou, T. Kolachina, N. Kumar, P. McVerry, **X. Wu**

**3:25** —**148.** Strategies of purification process development for bacterial recombinant vaccines. **T. Yuan**, Y. Yang

**3:45** — Intermission.

**4:05 —149.** A nicotine conjugate vaccine for the possible treatment and prevention of nicotine addiction. **A. Fattom**, S. Ennifar, G. Horwith, S. Fuller, P. Pentel, D. Malin, R. Naso

**4:25 —150.** Increase capsular polysaccharide production using fed-batch. Y. He, S. Mindel, E. McGill, D. Anderson, T. Kim, S. Carter, M. Brancieri, **A. Lages**

**4:45 —151.** Enzymatic versus chemical pretreatment of the fermentation broth of *N. meningitidis* to improve harvest recovery. A. Lages, **S. Ahuja**, B. Baibak

**5:05** — Concluding Remarks.

## WEDNESDAY MORNING

Section A

Convention Center -- Room 293

### Validation of Biopharmaceuticals Processes

B. D. Kelley and C. Chen, *Organizers*

**8:00** — Introductory Remarks.

**8:05 —152.** An approach to second sourcing of raw materials. **S. Abraham**, H. Bevan, A. Thomas, A. Westlake

**8:30 —153.** Development and qualification of a scale-down cell culture model for process validation. R. L. deVries, A. Gardner, **R. Gerber**, P. McAllister

**8:55 —154.** Bioburden monitoring and establishment of bioburden specifications for bioprocesses. **C. Z. Chen**, P. Yegneswaran

**9:20 —155.** Process validation approach for monitoring the performance of tangential flow filtration membrane devices. **J. T. Petrone**, T. Erdenberger, C. Esenther

**9:45** — Intermission.

**10:15 —156.** Design of a new chromatography column for cleaning effectiveness. **G. Kierans**, C. Antoniou, H. Carter, T. Dennen, A. Noyes

**10:40 —157.** Impact of column hardware on CIP and resolution during the scale-up in preparative biochromatography. **F. Drewe**, J. B. Lee

Section B

Convention Center -- Room 294

### Advances in Cell Culture Process Development

S. S. Ozturk and C. Ranucci, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**158.** Optimization of animal-component-free medium for CHO cell growth and recombinant protein production using statistical design. **R. Bhatia**, C. Robberson, T. Osborne, S. Walfish, J. Zhang

**8:25** —**159.** Development of feed concentrates for CHO fed-batch processes. **B. Horvath**, S. Gu

**8:45** —**160.** Enhancing batch efficiency by harvest/fill operations in manufacturing. **S. Chen**, A. Dadson, K. Carswell, F. Situ, A. Wajid

**9:05** —**161.** A challenge with Vero cell attachment in large-scale nunc cell factories. **I. Blumentals**, C. Ranucci, S. Choudhari, A. Harris, E. Houghton, B. Mowrer, S. Ozuna, R. Scott, J. Whipple, G. Zang, J. Aunins, C. Goochee

**9:25** —**162.** Protein glycosylation is controlled by cell culture conditions. **M. Butler**, N. Huzel, M. Yang, V. Restelli, J. Kunkel

**9:45** — Intermission.

**10:10** —**163.** Controlling product quality of a recombinant antibody produced in CHO cells by optimizing cell culture conditions. **J. C. Goodrick**, S. Kaneshiro, R. Kiss, T. Monica

**10:30** —**164.** Bottleneck analysis of the glycosylation pathway for galactose-fed CHO cells. **K. J. R. Clark**, S. W. Harcum, K. M. Bailey, F. W. R. Chaplen

**10:50** —**165.** Enhanced specific productivity at low culture temperature in recombinant Chinese hamster ovary cells depends on the integration site of a foreign gene. **S. K. Yoon**, G. M. Lee

Section C

Convention Center -- Room 297

### **Advances in Metabolic Engineering**

R. T. Gill and T. Dodge, *Organizers*

**8:00** —**166.** Use of metabolic models in metabolic engineering. **J. Forster**, J. Nielsen

**8:23** —**167.** Large-scale cybernetic modeling of protease production in *Bacillus subtilis*. **J. Varner**

**8:46** —**168.** What can we learn from systems biology? **J. S. Edwards**

**9:09** —**169.** Quantification and characterization of uncertainty in metabolic engineering. **V. Hatzimanikatis**, I. Birol, J. Shi, L. Wang

**9:32** —**170.** Numerical innovations in modeling and simulation of carbon bond labeling experiments. G. Sriram, **J. V. Shanks**

**9:55** — Intermission.

**10:10 —171.** Metabolic engineering of folic acid production. **T. Zhu**, R. Koepsel, M. M. Domach, M. Ataii

**10:33 —172.** Designing novel metabolic control in *Escherichia coli*. **W. C. Wong**, S. Lee, E. Fung, J. C. Liao

**10:56 —173.** Metabolic engineering of acetyl-CoA node and its effect on metabolic flux redistribution in chemostat *Escherichia coli* cultures. **R. V. Vadali**, G. N. Bennett, K. San

Section D

Convention Center -- Room 295

### **2002 Elmer Gaden Award**

D. S. Clark, *Presiding*

**11:40 —174.** Scalable bioprocesses for the controlled differentiation of embryonic stem cells. **P. W. Zandstra**

### **WEDNESDAY AFTERNOON**

Section A

Convention Center -- Room 293

### **Regulatory Science: An FDA Perspective**

K. Brorson, *Organizer*

**1:45 —** Introductory Remarks.

**1:50 —175.** Analytical methods development at FDA CBER: Analytical Chemistry staff, Office of Vaccines Research and Review. **A. Del Grosso**, J. May

**2:10 —176.** FDA CDER's perspective on specifications for peptide maps. **S. K. Moore**

**2:30 —177.** Product-directed research in the division of monoclonal antibodies. **K. Brorson**

**2:50 —178.** Regulatory considerations for rapid development of biological products. **P. G. Swann**

**3:10 —179.** Substrate specificity studies on recombinant *Campylobacter jejuni* N-acetylneuraminic acid synthetase. **A. Sundaram**, W. Vann

Section B

Convention Center -- Room 294

### **Advances in Biocatalysis**

R. R. Chen and D. Pollard, *Organizers*

**2:00 —180.** Pharmaceutical biocatalysis: Challenges of whole-cell bioconversions. **D. J. Pollard**, K. Telari, C. McWilliams, G. Humphrey, R. Greasham

**2:25 —181.** Ketoreductases in the synthesis of valuable chiral intermediates: Application in the synthesis of statine, phenylstatine, and their analogs. **S. Kambourakis**

**2:50 —182.** Cofactor regeneration of NAD<sup>+</sup> from NADH: Novel water-forming NADH oxidases. B. R. Riebel, **P. R. Gibbs**, W. B. Wellborn, A. S. Bommarius

**3:15 —183.** Improving redox biocatalysis by engineered cells. **J. D. Stewart**, A. Z. Walton, I. Kaluzna, B. D. Feske

**3:40 —** Intermission.

**4:00 —184.** Practical biohydroxylation with *Sphingomonas sp.* HXN-200: A highly active, regio- and stereoselective, and easy-to-handle biocatalyst. **Z. Li**, B. Witholt

**4:25 —185.** Application of a Baeyer-Villiger monooxygenase from *Cunninghamella echinulata* NRRL 3655. **C. S. Whitcher**, J. A. Littlechild, R. Wohlgemuth, J. M. Woodley

**4:50 —186.** Oxygen limitations in the biocatalytic BVMO catalyzed synthesis of lacones. **C. V. F. Baldwin**, J. M. Woodley

Section C

Convention Center -- Room 297

### **Advances in Metabolic Engineering**

R. T. Gill and T. Dodge, *Organizers*

**2:00 —187.** Expression profiling and high-temperature pressure adaptation of the hyperthermophilic methanarchaeon, *Methanococcus jannaschii*. **B. B. Boonyaratankornkit**, A. J. Simpson, C. B. Park, C. Fraser, N. M. El-Sayed, D. S. Clark

**2:25 —188.** Carbon flux analysis of metabolic reactions in cell-free protein synthesis. **K. A. Calhoun**, J. R. Swartz

**2:50 —189.** Metabolic engineering of yeast for polyketide biosynthesis. **N. A. Da Silva**, S. Lee, K. K. M. Lee, C. G. Ching, S. Mutka, J. T. Keasley

**3:15 —190.** Engineering *Streptomyces* bacteria to overproduce natural products. **C. Kao**, A. Lum, J. Huang, S. Cohen, C. R. Hutchinson

**3:40 —** Intermission.

**4:00 —191.** Rewiring cellular circuitry to improve biomanufacturing processes. **E. M. Driggers**, J. Royer, M. Askenazi, K. Madden, R. Doten, D. Zimmer, T. Feibelman, J. Trueheart, B. Cali

**4:25 —192.** Target hierarchy: The cases for interfering RNA and transient controllers. **W. E. Bentley**, S. F. Kramer, M. P. DeLisa, R. Srivastava, L. Wang, K. Carter, C. Tsao

**4:50 —193.** DNA array-based transcriptional analysis of the *Clostridium acetobutylicum* differentiation and degeneration programs. **E. T. Papoutsakis**, C. Tomas, K. Alsaker, H. Bonarius, W. Hendriksen, J. Beamish, H. Yang, C. Paredes

**5:15 —194.** A functional protein chip for in vitro metabolic engineering. **G. Stephanopoulos**, G. Jung

Section D

Convention Center -- Room 295

### **Advances in Tissue Engineering and Cell Therapy**

J. Ross and T. Ma, *Organizers*

**2:00** — Introductory Remarks.

**2:05 —195.** Development of in vitro and in vivo models of wound healing based on engineered tissues: A novel role of fibrin in wound healing. D. J. Geer, D. Swartz, **S. T. Andreadis**

**2:25 —196.** Use micropatterned biodegradable materials to control cell behaviors. Y. Wang, **C. Ho**

**2:45 —197.** Organization of cell-adhesion proteins at surfaces on a subcellular-length scale using colloidal particle assembly. N. J. Gleason, **J. D. Carbeck**

**3:05 —198.** Mathematical model for the depth-filtration seeding of human mesenchymal stem cells in 3-D nonwoven PET matrices. **W. L. Grayson**, T. Ma

**3:25 —199.** Physical and mechanical properties of porous scaffolds fabricated from a blend of starch and chitosan. **A. Subramanian**, H. Lin, M. Hanna, K. Kim

**3:45** — Intermission.

**4:15 —200.** Polysaccharide-based composite scaffolds for tissue engineering applications. A. Moshfeghian, Y. Huang, A. Sarasam, R. Lanman, **S. Madhally**

**4:35 —201.** Modeling of cell growth and nutrient consumption in hematopoiesis in a 3-D perfusion bioreactor. **P. Pathi**, T. Ma, B. R. Locke

**4:55 —202.** Tumor angiogenesis model with scaffold of small intestinal submucosa. **H. Yang**, R. R. Rivera, T. Ma

Section E

Convention Center -- Room 353

### **The Process of Process Development**

H. Pujar and J. Beck, *Presiding*

**3:40** — Introductory Remarks.

**3:45 —203.** Structured decisional-support tool for rapid bioprocess modeling. **A. C. Lim**, S. Farid, J. Washbrook, N. J. Titchener-Hooker

**4:10 —204.** Principles of fermentation process development and characterization: Application to fermentation development for vaccine manufacture. **T. Lee**, J. H. Crinean, J. R. Olges-Murphy, B. D. Bahler, S. H. Bauer, R. L. Hopfer, J. L. Cowell

**4:35 —205.** Selection of chromatographic media and conditions for preferred recovery processes. **T. N. Breece**, T. M. Nguyen, C. Schmelzer

**5:00 —206.** Using a high-throughput screening system for the development of scalable protein crystallization processes. **V. Klyushnichenko**

**5:25 —207.** Enabling faster process development: Automation of process monitoring assays. **P. DePhillips**, A. Bowman, K. Little, M. Vaccaro, M. Wenger, A. Lee

**5:50 —** Concluding Remarks.

### **Processes for Utilization of Agricultural By-Products**

*Cosponsored with Division of Agricultural & Food Chemistry*

### **WEDNESDAY EVENING**

Section A

Convention Center -- Hall J

#### **Poster Session**

Z. J. Li, G. Wei, and F. Agblevor, *Organizers*

**6:00 - 9:00**

**208.** Novel fluorescent pH indicator. **G. G. Yi**, Z. Diwu, L. Lavis, Y. Chen, J. Twu

**209.** Overcoming the barriers to batch process scheduling in the biopharmaceutical industry. **D. P. Petrides**, C. Siletti

**210.** Cloning of nattokinase genes and its preliminary studies. **J. Ling**, W. Du, L. Luo, R. Yang

**211.** Construction of a vector permitting immobilization and visualization of enzymes on compatible polymeric surfaces. **E. Sahin**, A. Taralp, Z. Sayers

**212.** Investigation of expression strength of various antibody gene arrangements in targeted CHO genome using an flpin CHO system. P. Fan, J. Larson, H. Qian, **J. zhu**

**213.** Medium characterization and optimization by amino acid screening and design of experiment. **J. H. Crinean**, J. R. Olges-Murphy, T. Lee, S. H. Bauer, R. L. Hopfer, J. L. Cowell

- 214.** Utilizing microarray technology for rapid identification of influenza A. **M. Townsend**, K. Rowlen
- 215.** Morphological changes and extent of autolysis in filamentous fungi as a response to pulse-feeding of nutrients. **J. Kadarusman**, M. R. Marten
- 216.** Characterization and transcriptional analysis of three adjacent *Thermotoga maritima* genes that show significant similarity to both aminopeptidases and endoglucanases. **J. K. Michel**, D. E. Ward, S. B. Connors, R. M. Kelly
- 217.** A tool for the rapid evaluation of process limitation using microscale experimentation. **F. Ahmed**, G. J. Lye, J. M. Woodley
- 218.** Effects of bionanoconjugation on protein-DNA interactions in Lac Repressor. M. K. Calabretta, **B. D. Yuh**, V. L. Colvin, K. S. Matthews
- 219.** Using atomic force microscopy to study micromechanical properties of the model fungus *Aspergillus nidulans*. **L. Zhao**, M. R. Marten, D. Schaefer
- 220.** Using proteomics to understand how rapidly changing nutrient environments can affect *E. coli* during fed-batch fermentation. **B. Raman**, M. R. Marten, M. P. Nandakumar
- 221.** A simple process strategy in filamentous fungal fermentation can significantly improve recombinant protein productivity. **S. Bhargava**, M. R. Marten, K. S. Wenger
- 222.** Engineering of a de novo disulfide bond formation pathway in *E. coli*. **L. Masip**, J. Collet, M. P. DeLisa, J. C. A. Bardwell, G. Georgiou
- 223.** Strategic engineering of *R*-oxynitrilase from almonds for industrial application. A. Glieder, W. Skranc, **P. Poehlauer**, H. Schwab, K. Gruber, R. Weis, M. Wubbolts, H. Mayrhofer
- 224.** The cDNA-derived amino acid sequence of hemoglobin II from *Lucina pectinata*. J. López-Garriga, C. L. Cadilla-Vázquez, **E. Torres-Mercado**
- 225.** Transfer of nisin gene cluster into the chromosome of *B. subtilis* 168. J. N. Hansen, **S. Yüksel**
- 226.** Transchip: A new system for studies of in vitro transcription of whole genomes. **T. Wu**, H. Yu, C. Churas, S. Zhou, D. C. Schwartz
- 227.** Generation of recombinant influenza virus using baculovirus as a delivery vehicle. **R. Grabherr**, K. Poomputsa, C. Kittel, L. Toellner, W. Ernst, A. Egorov
- 228.** Increasing acetyl-CoA pool in the presence of overexpressed phosphoenolpyruvate carboxylase or pyruvate carboxylase enhances succinate production in *Escherichia coli*. **H. Lin**, R. V. Vadali, G. N. Bennett, K. San
- 229.** Enhanced isoamyl acetate production in *Escherichia coli* upon manipulation of the acetyl-CoA node. **R. V. Vadali**, K. San, G. N. Bennett
- 230.** Expression studies of affinity-tailed green fluorescent proteins in *Escherichia coli*: Batch productivity differences when different immobilized metal affinity chromatography tails are employed. **H. Liu**, R. R. Beitle
- 231.** Expression and secretion of active lignin peroxidase in the yeast *Kluyveromyces lactis*. **N. A. Da Silva**, D. Shah, W. Panuwatsuk

- 232.** An investigation into the size-activity relationship of RNA catalysis. **T. M. Coleman**, F. Huang, J. Manning
- 233.** Protein engineering for shifting pH optimum of *Bacillus circulans* xylanase. **J. Yang**, Y. S. Choi, Y. J. Yoo
- 234.** Interaction of partially folded BPTI analogs with C191/C220A trypsin. **I. V. Getun**, J. Tulla-Puche, C. Woodward, G. Barany
- 235.** Cofactor metabolic engineering: Comparative study of the effect of increasing NADH availability in *E. coli* chemostat cultures on minimal and complex medium. **A. M. Sanchez**, K. San, G. N. Bennett
- 236.** Semiparametric regression analysis on yeast gene regulation prediction. **F. Pan**, X. Hu, W. Perrizo
- 237.** Probing aromatic amino acid biosynthesis in *Archaeoglobus fulgidus* using DNA microarray. **L. Rohlin**, S. Lim, I. Schroeder, H. Monbouquette, J. C. Liao
- 238.** Diagnosing biopharmaceutical fermentations using transcriptional profiling. **J. M. Bonomo**, R. T. Gill
- 239.** Metabolic engineering of *Saccharomyces cerevisiae* for the production of isoprenoids. **E. M. Paradise**, G. Y. Wang, J. D. Keasling
- 240.** Directed evolution to determine structure-function relationships in oxidosqualene cyclases. **S. P. T. Matsuda**, M. J. R. Segura, S. Lodeiro
- 241.** Metabolic engineering of yeast for the production of 1,2-propanediol. **N. A. Da Silva**, W. Lee
- 242.** Metabolomic application of NMR and MS: Tools for broad-screening metabolic pathways. **T. W. Fan**, **R. M. Higashi**, A. N. Lane
- 243.** Metabolic modeling for evaluating effects of pressure pulsation on glycerol production by *Candida krusei*. **W. Huang**, G. T. Tsao
- 244.** Monitoring cell culture by LDH measurements. **J. C. Lagos**, **Y. Tsao**
- 245.** Experimental versus simulated calibration models for in situ FTIR monitoring of bioprocesses. **S. Valentinotti**, H. Kornmann, M. H. Rhiel, U. von Stockar
- 246.** Bioreactor optimization for the production of a secreted reporter protein in CHO cells using an inducible expression system. **D. S. Kompala**, M. L. Lipscomb, M. C. Mowry
- 247.** Feeding strategy optimization for mammalian cell culture. **S. F. Gorfien**, W. C. Paul, J. L. Walowitz, D. A. Judd, L. D. Tescione, S. J. Jacobia, D. W. Jayme
- 248.** A multidimensional *K<sub>la</sub>* model to expedite cell culture process transfer. **J. A. Groves**, C. Chun, T. Ryll, S. Chamow
- 249.** Adaptation and propagation of A549 cells in suspension culture for the production of an adenoviral vector. **Z. Liu**, R. Longley, L. Radzniak, M. Santoro, M. Voloch
- 250.** Analytical methods for mammalian cell culture feed streams. **D. K. Rice II**, J. Zdanowicz, J. S. Goldfuss
- 251.** Applications of red fluorescent protein markers for indicating therapeutic protein expression and pericellular oxygen concentrations. **C. W. Yung**, Y. Hashimoto, W. E. Bentley, T. A. Barbari

- 252.** Investigation of bivalent antibodies binding on fluid supported phospholipid membranes: The effect of hapten density. **T. Yang**, O. K. Baryshnikova, H. Mao, M. A. Holden, P. S. Cremer
- 253.** A novel heat-shock protein prevents amyloid formation and toxicity. **S. Lee**, T. Good, K. Carson, A. Rice Ficht
- 254.** Control of temperature and pH enhances human monoclonal antibody production in CHO cell culture. **S. Oguchi**, H. Saito, M. Tsukahara, H. Tsumura
- 255.** Expression of EGFP reporter protein with a recombinant vaccinia virus: Comparison of microcarrier and cell-suspension-based bioreactor systems. **N. A. Bleckwenn**, W. E. Bentley, J. Shiloach
- 256.** Influence of mixing on phenotypic differences in well and poorly differentiated prostate cancer spheroids. **H. Song**, K. O'Connor, C. Giordano, S. Clejan, O. David, H. LeBeau
- 257.** A mini-bioreactor system for accelerated process development. R. Chen, S. Rajendran, K. Haverty, M. Tomkalski, P. Teplitsky, **G. Wei**, K. Namdev, R. Chillakuru
- 258.** pH-Sensitive surfactants for water-in-oil xanthan fermentation. **A. S. Restrepo**, **L. Ju**, J. M. Bell, J. Y. Xu
- 259.** Conversion of unsaturated fatty acids by compost bacteria. **T. M. Kuo**
- 260.** High-throughput screening of heterologous P450 expression in yeast. **J. A. Morgan**, H. Jiang, D. chen
- 261.** Microbubble fermentation of recombinant *Pichia pastoris* for human serum albumin production. W. Zhang, **F. A. Agblevor**
- 262.** Methods for evaluation of composite latex coatings containing *Gluconobacter oxydans*: Accurate determination of the effectiveness factor for the oxidation of D-sorbitol to L-sorbose in oxygenated microbioreactors. C. W. Solheid, **S. P. Charaniya**, U. Diel, M. C. Flickinger
- 263.** Control of methanol feed for *Bacillus methanolicus* fermentation via mass spectrometry. **C. F. Komives**, C. Wang, S. Rech
- 264.** Biopesticide production through fermentation and entrapment of *metarhizium anisopliae* spores. Y. chen, J. Vaughan, **F. A. Agblevor**
- 265.** Biosynthesis of germanium oxide by marine diatoms. **G. L. Rorrer**, C. Chang, C. Jeffryes
- 266.** Continuous pH monitoring during shake flask fermentations using optical sensors. **H. R. Kermis**, Y. Kostov, P. Harms, G. Rao
- 267.** On-line process monitoring of moisture measurements and reaction kinetics by near-infrared spectroscopy for a polysaccharide vaccine. **J. B. Fletcher**, E. P. Wen, S. L. Sagar, A. L. Lee
- 268.** On-line cell mass monitoring of *Saccharomyces cerevisiae* fermentations by multi-wavelength fluorescence. **M. Haack**, A. Eliasson, L. Olsson
- 269.** Large-scale expression and purification of hemoglobin I from *Lucina pectinata*. **E. A. Collazo-Santiago**, J. Lopez-Garriga, C. L. Cadilla
- 270.** Characterization of fermentation process by design of experimental to reduce project time. **J. R. Olges-Murphy**, J. H. Crinean, T. Lee, S. H. Bauer, R. L. Hopfer, J. L. Cowell

- 271.** The role of computer modeling in bioprocess development and technology transfer. **C. Siletti**, D. Petrides
- 272.** Design of experiment applied to fermentation process optimization and characterization for validation. **B. D. Bahler**, T. Lee, S. H. Bauer, R. L. Hopfer, J. L. Cowell
- 273.** Technical and economic feasibility of a novel, low-energy sterilization process. **J. Zhang**, J. Li, H. Kaiser, G. L. Thomson, T. Thomas, T. Davis, M. Matthews
- 274.** Sample self-displacement purification of an antisense oligonucleotide by anion exchange membrane chromatography. **A. Lajmi**, T. Warner, Y. Sanghvi
- 275.** Compaction agent clarification of microbial lysates. **B. DeWalt**, J. C. Murphy, T. Cano, J. Zijffer, G. E. Fox, R. C. Willson
- 276.** Membranes from whey protein isolate: Studies of flux and rejection. J. Y. Teo, **R. R. Beitle**
- 277.** Alternatives to protein A resin evaluated for the purification of human antibodies. **R. Alsop**, L. Nguyen, G. Zapata
- 278.** Dissolved oxygen affects the accumulation of recombinant clostridia peptide fragment in *E. coli*. **N. G. Dalal**, J. Geva, R. Fass, J. Shiloach
- 279.** Aromatic thiols as redox buffers: Increasing folding rates for disulfide-containing proteins. **J. D. Gough**, W. J. Lees
- 280.** Characterization and optimization of a pseudobioaffinity-based antibody separation method. **A. Subramanian**, J. Hommerding, S. Roy, C. Mascoli
- 281.** Hydrophobic interaction chromatography: Effect of water, salt types, and process modeling. **F. Xia**, D. Nagrath, S. M. Cramer
- 282.** Chromatography resin evaluation procedures. **M. E. Cameron**, R. Seely, K. Sabados, H. Harker
- 283.** Development of a library of cation-exchanger salt-tolerant media based on a multimodal interaction approach. **J. Maloisel**, N. Thevenin, E. Brekkan
- 284.** Purification of 2-gram parenteral, low copy-number plasmid for phase I/II clinical trials on an ÄKTA purifier chromatography system. **S. Herzer**, Z. Mei, C. L. DeSombre, X. Zhang, D. R. Rill
- 285.** Scale-down of continuous filtration for rapid bioprocess design. **T. S. Reynolds**, R. M. Boychyn, M. Bulmer, J. More, M. Hoare
- 286.** Evaluation of filters for the removal of *E. coli* proteins. **C. W. Richey Jr.**, J. Seely, H. Rushing
- 287.** Streamlining *Escherichia coli* S30 extract preparation for economical cell-free protein synthesis. **D. V. Liu**, J. F. Zawada, J. R. Swartz
- 288.** The evaluation of column performance over the lifetime of sepharose high-performance resin. **D. J. Dripps**, T. Taggart, T. Kessler, M. Cameron, R. Todd, J. Seely
- 289.** Topoisomerase-targeting anticancer drug screening by capillary electrophoresis. **J. Chen**, G. Liu, M. Du, Y. Huang, Y. Ma

- 290.** A new pectate lyase from *Bacillus pumilus* for bioscouring. **B. Klug**, W. Schnitzhofer, K. Robra, G. M. Guebitz
- 291.** Differential stability of a monoclonal antibody in acetate, succinate, citrate, and histidine buffer systems. **N. Piros**, M. E. M. Cromwell, S. Bishop
- 292.** Effect of stainless steel exposure on the stability of a recombinant humanized IgG1 monoclonal antibody. R. Wong, **S. Lo**, C. Quan, W. Lau, S. Wang
- 293.** Chip devices for CEC of peptides and proteins using various stationary phase materials. **R. Jindal**, S. M. Cramer
- 294.** Evaluating chromatographic process variability using design of experiments. **E. R. Cunningham**, D. Myers, C. Bork, L. E. Conley
- 295.** Highly concentrated formulations of the HIV-1 entry inhibitor PRO 542. **K. Prakash**, L. Zhao, D. Fisch, S. Rosenfield, K. Nagashima, N. Schülke, W. Olson
- 296.** Bridged diarylmethane fluorescent probes for labeling biomolecules. **W. Zhou**, Z. An, J. Lavin, S. R. Marder
- 297.** Hydrophobic interaction chromatography: Using design of experiments to determine critical process parameters. **M. W. Baillargeon**, D. A. Ross, D. Eisenhauer, E. O. Lundell
- 298.** Enzymatic method for detection of specific DNA-protein interactions. **G. E. Sroga**, J. S. Dordick
- 299.** Preparative continuous annular chromatography: Investigations on the "peak wobbling" phenomenon. R. van Wegen, **J. Prior**
- 300.** Screening of isolated cells via arrays of impedance sensors. **D. Nguyen**, H. Xiaoqiu, T. Afentakis, M. Hatalis, M. Domach, D. Greve
- 301.** Characterization of 3-D collagen hydrogels for functional cell-based biosensing. C. Mao, **W. S. Kisaalita**
- 302.** A novel immunoassay for atrazine using tunable immunosorbent. **J. Kim**, **A. Mulchandani**, **W. Chen**
- 303.** Establishment of efficient systems to quantify human monoclonal antibody for the selection of production cells. **T. Nakagawa**, Y. Takamatsu, M. Tsukahara, T. Kadoya, H. Tsumura
- 304.** Objective and quantitative method for titration of nonoccluded baculovirus. **O. T. Ramírez**, J. A. Mena, L. A. Palomares
- 305.** New tissue micro-osmometer. **F. Horkay**, A. S. Berman, P. J. Basser
- 306.** Direct cell and tissue analysis by infrared DIOS. **S. M. Dutta**, D. J. Rousell, K. K. Murray
- 307.** Measurement of the elastic modulus of thin gel layers by the atomic force microscope. E. K. Dimitriadis, **F. Horkay**, B. Kachar, R. S. Chadwick
- 308.** Microfluidic chip detection using MALDI mass spectrometry. **D. A. Narcisse**, **H. K. Musyimi**, X. Zhang, S. A. Soper, K. K. Murray
- 309.** Novel assembly platform for integrating biological species within MEMS devices. **H. Yi**, L. Wu, D. A. Small, T. Chen, R. Ghodssi, G. W. Rubloff, G. F. Payne, W. E. Bentley

- 310.** Protein aggregation kinetics: Applications to protein A chromatography. **P. Gupta**, A. A. Shukla
- 311.** Bti toxin Cyt1A in the lipid bilayer: Aggregation and the membrane damage. **S. D. Manceva**, P. S. Russo, M. Pusztai-Carey, P. Butko
- 312.** Biodegradable microparticles as potent delivery systems for vaccines: Experimental measurement of factors governing antigen adsorption and efficacy. **J. Chesko**, J. Kazzaz, M. Ugozzoli, M. Singh, D. O'Hagan
- 313.** Stable surface attachment and detection of fusion proteins. **S. B. Brueggemeier**, S. P. Palecek
- 314.** Use of biarsenic labels to monitor protein-protein interactions. **H. Eliason**, **M. S. Shekhani**, M. Robers, K. W. Vogel, G. T. Hanson, K. L. Vedvik, C. Rüttimann-Johnson, N. Qadir
- 315.** Automated docking of phospholipids to the phospholipase D active site: Insight into the catalytic mechanism. **C. L. Aikens**, A. Laederach, P. J. Reilly
- 316.** Effect of molecular weight on the expression and characterization of a self-assembling peptide. **W. D. Marner II**, N. L. Goeden-Wood, J. D. Keasling, S. J. Muller
- 317.** Synthesis of protein-based artificial transaminase by site-directed mutagenesis and chemical modification. **C. Tann**, D. Qi, M. D. Distefano
- 318.** Comparison of immunoassay-blocking strategies on metal oxide substrates. **A. N. Scribner**, C. L. Cole, R. J. Colton, L. J. Whitman
- 319.** Synthesis and biophysical characterization of template-assembled GALA. **D. H. Haas**, R. M. Murphy
- 320.** Evolvability of random polypeptides through functional selection. **A. Yamauchi**, I. Urabe, T. Yomo
- 321.** Generation of a semisynthetic oxidoreductase via chemical and genetical modification. **C. Tann**, M. D. Distefano
- 322.** Elimination of oxygen limitation in enzymatic reactions. **A. T. Y. Cheng**
- 323.** Hydrolysis of oligosaccharides using strong cation exchange catalyst and cellulase enzymes. **Y. M. Kim**, N. S. Mosier, R. Hendrickson, J. Goetz, M. R. Ladisch
- 324.** Activity and kinetics of bovine pancreatic ribonuclease in organic-aqueous media. **S. Emadi**, F. Masdar-al Omour
- 325.** Effect of silicon atom in substrates on (*R*)-oxynitrilase-catalyzed enantioselective synthesis of (*R*)-ketone cyanohydrin. N. Li, **M. H. Zong**, C. Liu, H. S. Peng
- 326.** Enzymatic ammonolysis of trimethylsilylmethyl acetate in microaqueous phase. H. S. Peng, **M. H. Zong**, Y. Q. Xu
- 327.** Enzymatic enantioselective synthesis of (*R*)-2-trimethylsilyl-2-hydroxyl ethylcyanide. N. Li, **M. H. Zong**, C. Liu, H. S. Peng
- 328.** Lipase-catalyzed enantioselective esterification of 1-(trimethylsilyl)ethanol in organic solvent. H. Wu, **M. H. Zong**, D. H. Luo
- 329.** Effects of various parameters on the enzymatic degradation of chlorogenic acid in model and sunflower

meal systems. E. R. Martinez, **Z. Duvnjak**

**330.** Enzyme mediated production of free lutein from marygold flowers in nonaqueous media. **E. Bárzana**, M. J. Mora-Pale, S. Pérez-Munguía, M. López-Vargas, A. Lopez-Munguía

**331.** Production of biodiesel fuel from soybean oil catalyzed by lipozyme TL in a solvent-free medium. **Y. Xu**, W. Du, D. Liu

**332.** Structural differences between bovine and porcine vitreous humor. **F. Y. Ohene**

**333.** Studies on coagulation factor VIIa autoproteolysis and formation of degradation products. **J. C. Krarup**, **T. B. Hansen**

**334.** Collagen-hydroxyapatite multilayer sheet (fish scale model). **K. Yamauchi**, T. Tanabe, T. Goda

**335.** Controlled nanostructures assembly based on DNA-protein interactions. **G. E. Sroga**, J. S. Dordick

**336.** In vivo gene transfection into rat brain cells: A comparison between viral, polyethyleneimine, and calcium phosphate nanoparticle methods. **T. D. Corso**, I. Roy, M. Bland, T. Buckley, A. S. Gambino, L. C. Jenkins, B. Cranston, J. Myers, E. Stachowiak, E. J. Bergey, P. N. Prasad, D. Bloom, W. J. Bowers, M. K. Stachowiak

**337.** Surface characterization and in vitro protein adsorption studies of sol-gel derived ultrathin titanium oxide layers. **M. C. Advincula**, X. Fan, J. E. Lemons, R. Advincula

**338.** Binding of perfluorooctanoic acid to rat and human plasma proteins. **X. Han**, T. A. Snow, R. A. Kemper, G. W. Jepson

## THURSDAY MORNING

Section A

Convention Center -- Room 293

### Advances in Biocatalysis

R. R. Chen and D. Pollard, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**339.** Accelerated biocatalyst stability testing for process optimization. **P. R. Gibbs**, U. Neunert, A. S. Bommarius

**8:25** —**340.** Multi-enzymatic synthesis of xylulose 5-phosphate. **J. Shaeri**, E. B. Rathbone, I. Wright, R. Wohlgemuth, J. M. Woodley

**8:45** —**341.** Natural vanillin synthesis from corn bran. **R. R. Chen**, **N. Win**, K. Brunson

**9:05** —**342.** Formation of lactobionic acid by a novel biocatalytic process. **R. Ludwig**, M. Ozga, M. Zamocky, K. D. Kulbe, D. Haltrich

**9:25** —**343.** Biocompatible and degradable biocatalytic dextran hydrogels. **L. S. Ferreira**, A. M. S. Cabrita, A. Rafael, M. H. Gil, J. S. Dordick

**9:45** — Intermission.

**10:15** —**344.** Surface hydrophobicity of silica supports effects activity of immobilized enzymes in organic reactions. **J. P. Lindsay**, R. F. Wormsbecher, J. S. Dordick

**10:35** —**345.** Optimizing the cell concentration in thin, microporous latex biocatalytic coatings containing nongrowing *Gluconobacter oxydans* for very high oxidation rates of D-sorbitol to L-sorbose. **S. P. Charaniya**, C. W. Solheid, M. C. Flickinger

**10:55** —**346.** Efficient encapsulation of alcohol dehydrogenase in silicate matrix via sol-gel process as biocatalyst. **Z. Jiang Sr.**

Section B

Convention Center -- Room 294

### Continuous Bioprocessing

J. H. Vogel and A. Jungbauer, *Organizers*

**8:00** — Introductory Remarks.

**8:05** —**347.** Continuously perfused fluidized bed fermentation for large-scale production of r-protein and monoclonal antibodies: Process stability and scale-up. **G. Blueml**, K. Landauer, M. Duerrschmid, S. Wiederikum, H. Klug, O. Doblhoff-Dier, H. Katinger

**8:25** —**348.** Quantifying physiology and metabolism of mammalian cells in continuous perfusion culture. **C. Goudar**, R. Heidemann, J. H. Vogel, J. Michaels, K. B. Konstantinov

**8:45** —**349.** Protein refolding by continuous chromatography. H. Lanckriet, **A. P. J. Middelberg**

**9:05** —**350.** Continuous matrix-assisted refolding using annular chromatography: A technology for quantitative conversion of unfolded proteins into native proteins. **A. Jungbauer**, C. Machold, R. Schlegl, W. Buchinger

**9:25** —**351.** Kinetics and reactor design for continuous and semicontinuous processing of cellulosic biomass via simultaneous saccharification and fermentation. **X. Shao**, C. E. Wyman, L. R. Lynd

**9:45** — Intermission.

**10:10** —**352.** Solvent gradient operation of simulated moving bed processes. **M. Mazzotti**, S. Abel, L. Aumann, M. Morbidelli

**10:30** —**353.** In-line, online optimization of a new SMB technology working as single-column system. **P. Poetschacher**

**10:50** —**354.** Advances toward process-scale countercurrent chromatography and the prospect of continuous countercurrent extraction. **I. Sutherland**

Section C

Convention Center -- Room 295

## Mechanistic Aspects of Virus-Cell Interactions

D. V. Schaffer, *Organizer*

**8:00** — Introductory Remarks.

**8:05** —**355.** Simulations of virus binding using Brownian adhesive dynamics. **D. A. Hammer**, T. English

**8:25** —**356.** Cell targeting using metabolically biotinylated adenoviral vectors. **M. A. Barry**, M. B. Parrott, S. Campos, K. E. Adams

**8:45** —**357.** Study of the adsorption effect on the diffusion of recombinant adenoviruses toward 293S cells. **A. Garnier**, A. Gilbert, A. Kamen

**9:05** —**358.** A controllable gene delivery muscle patch. **J. Bonadio**, M. Salva

**9:25** —**359.** Monitoring viral spread and the development of cellular defensive responses to vesicular stomatitis virus infections in vitro. **V. Lam**, K. Duca, J. Yin

**9:45** — Intermission.

**10:15** —**360.** Retrovirus gene transfer to epidermal stem cells: The role of integrins and extracellular matrix. **S. T. Andreadis**, B. Bajaj

**10:35** —**361.** Effects of lipid rafts on the dynamics of retrovirus trafficking. **K. Lim**, J. Yin

**10:55** —**362.** Designing a gene therapy to prevent AIDS but maintain HIV. **L. S. Weinberger**, D. V. Schaffer, A. P. Arkin

## Processes for Utilization of Agricultural By-Products

*Cosponsored with Division of Agricultural & Food Chemistry*

## THURSDAY AFTERNOON

Section A

Convention Center -- Room 293

## Advances in Biocatalysis

R. R. Chen and D. Pollard, *Organizers*

**2:00** —**363.** Directed evolution of alkane hydroxylation activity in cytochrome P450 BM-3. F. H. Arnold, **M. W. Peters**, P. Meinhold, E. T. Farinas, A. Glieder, C. W. Bugg

**2:20** —**364.** Engineering a protein molecular switch by combinatorial domain insertion. **M. Ostermeier**, G. Guntas

**2:40 —365.** Enzymology of xylose utilization in yeast: Coenzyme specificity of xylose reductase from *Candida tenuis* analyzed by site-directed mutagenesis and X-ray crystallography. **B. Nidetzky**, B. Petschacher, M. Klimacek, K. L. Kavanagh, D. K. Wilson

**3:00 —366.** Novel screening method for enzyme activity and enantioselectivity using surface-enhanced resonance Raman scattering. **L. C. Stevenson**, D. Graham, B. D. Moore

**3:20 —367.** Flow cytometric screening of chimeric glutathione transferase libraries expressed in *Escherichia coli*. **K. E. Griswold**, Y. Kawarasaki, T. Selzer, J. D. Stevenson, S. Benkovic, B. L. Iverson, G. Georgiou

**3:40 —** Intermission.

**4:10 —368.** Microarray-based enzymatic modification of immobilized substrates for drug discovery. **L. Santhanam**, M. G. Hogg, J. A. Holland, J. S. Dordick

**4:30 —369.** Solid-phase biocatalytic amplification of the natural product bergenin. **U. Akbar**, J. S. Dordick, D. S. Clark

**4:50 —370.** Comparative thermostability/thermoactivity analysis of class II xylose isomerases for high-fructose corn syrup production at elevated temperatures. **K. L. Epting**, T. V. Pearce Jr., C. Vieille, D. Sriprapundh, J. G. Zeikus, R. M. Kelly

Section B

Convention Center -- Room 294

## **Separations and Process Technology for Genetic Therapy and Diagnosis**

*Cosponsored with Biotechnology Secretariat*

J. C. Murphy, *Presiding*

R. C. Willson, *Organizer*

**2:00 —** Introductory Remarks.

**2:05 —371.** The impact of nanotechnology on the development of cell isolation, separation, and expansion. **G. Keller**, J. Martinec, D. Richard

**2:25 —372.** Sequence-specific oligonucleotide purification using peptide surfactants. **J. W. Schneider**, J. P. Vernille, B. F. Marques

**2:45 —373.** Plasmid purification by environmentally triggered precipitation. **J. Kostal**, A. Mulchandani, W. Chen

**3:05 —374.** Plasmid DNA production using compaction agents and immobilized metal-affinity chromatography. **T. Cano**, J. Murphy, G. E. Fox, R. C. Willson

**3:25 —375.** Purification of supercoiled plasmid DNA by selective calcium silicate adsorption of closely related impurities. **M. A. Winters**, J. D. Richter, S. L. Sagar, R. J. Lander

**3:45 —** Intermission.

**4:05 —376.** Metabolic biotinylation of proteins and viral vectors for purification from mammalian cells. **M. A. Barry**, M. B. Parrott, K. E. Adams, S. Campos, D. Ghosh

**4:25 —377.** Viral vectors for gene therapy: New purification challenges. **S. Herzer**, R. Morenweiser, N. Brument, P. M. Moore

**4:45 —378.** Review of novel technologies for use as a virus barrier to eliminate adventitious contamination of viral drug products. **R. Pearce**, H. Lutz

Section C

Convention Center -- Room 295

### **Advances in Plant Biotechnology**

J. V. Shanks and J. A. Morgan, *Organizers*

**2:00** — Introductory Remarks.

**2:05 —379.** Expanded- and fixed-bed adsorption in capture of proteins from plant extracts. C. E. Glatz, **T. J. Menkhaus**, Y. Bai

**2:25 —380.** Metabolic flux analysis of *Catharanthus roseus* hairy roots using a carbon bond labeling experiment. G. Sriram, B. Fulton, **J. V. Shanks**

**2:45 —381.** Metabolic flux analysis of halogenated monoterpene biosynthesis in microplantlet suspension cultures of marine red macroalgae. **G. L. Rorrer**, J. P. Polzin

**3:05 —382.** Study of polyunsaturated fatty acid synthesis in *Glossomastix chrysoplastos*, a marine microalgae, through optimization of bioreactor conditions and desaturase expression. **T. Y. Hsiao**, H. W. Blanch

**3:25 —383.** Investigating cell subpopulation dynamics of *Taxus* cell suspension cultures: A single cell method. **M. C. Naill**, S. C. Roberts

**3:45** — Intermission.

**4:05 —384.** Metabolic engineering of indole alkaloid pathways in *Catharanthus roseus* hairy roots. **E. H. Hughes**, S. Hong, S. Gibson, J. V. Shanks, K. San

**4:25 —385.** Analysis of theoretical metabolic yields under photo-autotrophic conditions. **J. A. Morgan**, O. M. Akpobasah

### **Processes for Utilization of Agricultural By-Products**

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Submit Final Program