CONTACT: MATT HOELTER (SEE P6)

April, 2005

Volume 10, Issue 2

AES Newsletter

Call for papers!!

Abstract deadline is May 25 for the 2005 AES meeting (July 1 for AES posters).

Inside this issue:

Many thanks to our Sponsors for contributions funding the 2004 and 2005 meetings.

Bio-Rad Laboratories

CBS Scientific

GE HealthCare

Genencor International

Nonlinear Dyanmics

Proctor & Gamble

Proteome Systems

Scimagix

Syngene

Our traditionally strong meetings, with sessions chaired by invited plenary speakers discussing state-of-the-art topics, would simply not be possible without funding from sponsors. These donations are greatly appreciated.

The annual meeting of the American Electrophoresis Society will be held in Cincinnati, Ohio Oct 30 - Nov 4, 2005.

A strong meeting is in the making as you will see on the following pages. Now we need your abstracts to make it complete. The deadline is May 25, 2005 for abstracts of talks and July 1 for late-breaking posters. Abstracts received after May 25 will be assigned to posters but, as was done last year, the posters will be up for 3 days (Monday through Wednesday) so there will be ample time for viewing. We encourage all presenters to also include their work in the complementary poster session.

To submit an abstract (also called PTP for proposal to present) go to: http://aiche.confex.com/aiche/2005/cfp.epl, scroll down to TA, click on Topical A - AES and follow the instructions. After May 25 submit late breaking abstracts to Matt Hoelter (matt-aes@tds.net) by email.

Session descriptions are provided on pages 2-5 to help you decide where to direct your abstract. As you will see, the program is divided into 3 tracks:

- **Track 1: Advances in Proteomic Analysis**. Sessions TA001 - TA004.
- **Track 2: BioMEMS and Microfluidic Technology.** Sessions TA005-TA008 and also co-sponsored 15C11.
- **Track 3: Electrokinetics and Fundamentals**. Sessions TA009-TA011.

If you still have questions after reading the session descriptions, please feel free to email the session chairs for advice.

Victor Ugaz and Adrienne Minerick
Meeting Co-Chairs

The annual AES meeting will be held as a topical conference within the larger meeting of the American Institute of Chemical Engineers (AIChE). The AIChE meeting will have 20 forums, 13 topical conferences and 575 sessions. Over 4000 chemical engineers are expected to attend; many of their topicals are of interest to AES members. Descriptions of the 12 sessions of the AES meeting program and one co-sponsored session (15C11) follow.

TA001 - Advances in Proteomic Analysis: Affinity-based Approaches

Systematic studies of gene expression patterns play a vital role in understanding the complex interactions associated with the global response of cells, tissues, and organisms to stimuli or mutations. While recent developments have allowed these patterns to be investigated at an unprecedented level of detail, further advances are needed in order to fully illuminate the interplay among the many factors governing cellular response. Specifically, new technologies are needed with the capability of providing quantitative information with greatly enhanced levels of sensitivity and throughput. This session will focus on the development of novel techniques to address these limitations, including ultra-sensitive protein detection, high-throughput antibody creation and optimization, the development of protein-detecting microarrays, and other related technologies.

Chair: Victor Ugaz
Texas A&M University
Email: ugaz@tamu.edu

Co-Chair: Adrienne Minerick
Mississippi State University
Email: minerick@che.msstate.edu

TA002 - Advances in Proteomic Analysis: Electrophoresis-based Approaches

Electrophoresis technology continues to be a vital tool for quantitative proteomic analysis. 2-D gel electrophoresis techniques allow multiple gene expression patterns to be simultaneously monitored to identify and characterize complex cellular interactions. This session will focus on the development of proteomic technologies and their application to biotechnology. Of particular interest are papers describing advances in gel-free protein separations, novel protein stains, methods of analyzing membrane proteins, and mass spectrometric methods. Papers are also sought that present research on the application of proteomics to the study of bacterial, animal, and plant cell cultures, and especially proteomic analysis of post-translational modifications.

Chair: Feng Wang
Procter & Gamble Pharmaceuticals
Email: wang.f@pg.com

Co-Chair: Ray Grant
Procter & Gamble Pharmaceuticals
Email: grant.r@pg.com

TA003 - Advances in Proteomic Analysis: Biomedical Applications

Proteomics offers biomedical researchers powerful new approaches to globally investigate the molecular basis of disease, drug action, and development. A proteomics approach, identifying protein targets associated with various diseases, can ultimately provide a basis for early disease detection and eventually rational design of pharmacological intervention. This session will especially explore novel applications of electrophoretic, chromatographic, immunologic, and mass spectrometric technologies to analyze proteomes for ultimate clinical benefit.

Chair: Charles Henry
Colorado State University
Email: cshenry@lamar.colostate.edu

TA004 - Advances in Proteomic Analysis: Focus on Bioinformatics

Proteomics technologies generate dauntingly large amounts of heterogeneous data types, and thus, are highly dependent on informatics. This session will cover a broad range of topics in Bioinformatics related to Proteomics. LIMS, image analysis systems and databases are needed for generation and maintenance of proteomics data. Data and image storage systems are needed in addition to "encyclopedia" type systems that catalog results. Fundamental questions regarding formats for data exchange and storage as well as architectures for archiving public proteomics data are still being formulated. Simple aggregation of proteomics data as well as the more challenging integration of datasets both within proteomics and between proteomics and other disciplines (genomics, metabolomics) are still in their infancy. A broad range of specialized tools are needed for analysis of proteomics data, including statis-

tical analysis and pathway mapping and new intelligent systems to aid data interpretation and hypothesis generation. As the proteomics and bioinformatics communities focus their efforts on developing the necessary computational and informatics infrastructure, a rapidly growing open source effort has arisen to more effectively address the need for standards and new computational tools.

Chair: Ruth Vanbogelen
Pfizer Inc.
Email: Ruth.Vanbogelen@pfizer.com

Co-Chair: Philip Andrews
University of Michigan
Email: andrewsp@umich.edu

TA005 - BioMEMS and Microfluidic Technology for Biomedical and Diagnostic Applications

Medical diagnostic kits encompass a wide variety of portable analytical devices used to monitor medical conditions. They are rapidly being developed for use on a single-test basis and show promise as tools for clinical research and at home self-testing. The terms "microdevice", "microchip" and "lab-on-a-chip" all refer to small, inexpensive devices that may be engineered for biomedical applications. The goals of this session are to bring together researchers from academia and industry to exchange ideas for revolutionizing medical diagnostics. Subjects of interest include cellular analysis in microdevices; development and fabrication of innovative devices; novel biofluid separators; advances in microanalytical systems; electrokinetics; dielectrophoresis; advances in chemical, electrochemical, and optical in-line sensor technology; and novel low concentration detection in capillary electrophoresis systems. Original contributions to BioMEMS and biological microfluidics are encouraged.

Chair: Joseph J. Biernacki
Tennessee Technological University
Email: jbiernacki@tntech.edu

Co-Chair: Adrienne R. Minerick
Mississippi State University
Email: minerick@che.msstate.edu

TA006 -BioMEMS and Microfluidic Technology for Proteome Analysis Applications

Microfluidic technology holds the promise of enabling novel, more efficient, and higher throughput proteomic and genomic analyses in a low-power portable format. As products based on microfluidics are introduced commercially, the promise is becoming a reality. This session seeks papers on chip-based novel methods for proteomic analysis including sample prep, electrokinetic approaches in 1D and 2D, and microfluidic interfaces with downstream analytical instrumentation (e.g. electrospray mass spectrometry).

Chair: Chong Ahn
University of Cincinnati
Email: chong.ahn@uc.edu

TA007 - BioMEMS and Microfluidic Technology for Cell and Biomolecule Analysis

The ability to study processes at the single-cell level promises to provide a host of information with benefits in the area of therapeutics and drug discovery. In this session, we invite papers describing microfluidic technology to probe chemical and biochemical responses at the cellular and sub-cellular levels. In addition, we welcome contributions focused on any related aspects including simulation and modeling studies, materials modification to improve system performance, novel sample preparation protocols, and analytical techniques.

Chair: Steven A Soper
Louisiana State University
Email: chsope@lsu.edu

Co-Chair: Pat Limbach
University of Cincinnati
Pat.Limbach@uc.edu

TA008 - New Developments in Bioanalytical CE and Microdevice Technology

Electrophoresis is proven to be an invaluable tool in the bioanalytical research areas of genetic analysis, pharmaceutical development, and protein characterization. Advances in these areas have been forwarded by enhancement of the basic electrophoretic format such as sample focusing techniques, novel replaceable physical gels, and secondary separation methods using advantageous additives such as surfactants or chiral selective molecules in the run buffer. Advances in microfabrication have made it possible to implement these standard capillary electrophoresis techniques on microdevice formats, with potential improvements including high

Cont. next page

throughput, reduced cost, small sample requirements and the lure of portability. This session will focus on technical aspects of the development and improvement of CE and electrophoretic microdevice platforms for the efficient separation of DNA, proteins, and other biomolecules for bioanalysis, with an emphasis on integrated sample preparation, unique replaceable gel formulations, microchannel surface functionalization, secondary separation mechanisms, and microdevice design.

Chair: Rebecca A. Zangmeister
Natl Institute of Standards and Tech
Email: razang@nist.gov

Co-Chair: Gloria Thomas
Mississippi State University
Email: gthomas@chemistry.msstate.edu

TA009 - Advances in Electrokinetics and Electrophoresis

Electrokinetic techniques continue to play a leading role in technologies ranging from nanoparticle characterization and directed electronics assembly to micropumps and micromixers to biosensors and DNA sequencing. In this session, we invite submissions related to the development of new technologies in any of these areas, from both the fundamental and applied perspectives. Suitable topics include: microfluidic networks and their applications (including mixing, reaction, separations, or transport processes); complex particles and surfaces (nanoparticles, heterogeneous particles, biological cells, soft particles); electrokinetically-directed assembly; electrokinetic effects in non-polar media; novel applications of electrokinetic phenomena (biosensors, displays, environmental or chemical assays); and novel measurement techniques (electrophoretic mobility, charge nonuniformity, forces, electro-acoustics, electro-optics).

Chair: James C Baygents
University of Arizona
Email: jcb@maxwell.che.arizona.edu

TA010 - Environmental and Colloidal Applications of Electrokinetics

Electrokinetics involves the use of electrical forces between surfaces and particles to produce a motion of colloidal particles within a fluid or porous medium. Notable applications include decontamination of water, soil and industrial effluents. Electrostatics aspects in membrane-based separation processes is another excellent example as is micro-filtration in electrically enhanced processes. Within this framework, a detailed analysis of particle-to-particle electrostatics forces including computer-based simulation approaches are relevant for the advance of technology involving electrokinetics principles. Contributions with novel approaches related to fundamental principles, modeling, and experimental studies will be welcomed. We would like to have a balance between a given problem, the motivation, and the outcome. However, purely experimental contributions describing new and novel aspects of electrokinetics will be welcomed as well as theories and computational efforts helping to improve understanding of outstanding fundamental problems.

Chair: Pedro E. Arce
Tennessee Tech University
Email: parce@tntech.edu

Co-Chair: Mario Oyanader
Universidad Catolica del Norte, Chile
Email: oyanader@ucn.cl

TA011 - Advances in Sensing, Detection, and Integration in Bioanalytical Systems

Remarkable advances in the development of miniaturized sensing and analytical components for use in a variety of biomedical and genomic applications. However, the ability to assemble and interface individual components in order to achieve a high level of integration in a complete working device continues to pose a host of challenges. In this session, we invite contributions dealing with any aspects of integration, both among components at the microscale and between the microscale device and the macroscale external environment. Both experimental and theoretical contributions are welcome.

Chair: Paul Takhistov
Rutgers University
Email: Takhistov@AESOP.Rutgers.edu

Co-Chair: Fred Battrell
Micronics, Inc
Email: fbattrell@micronics.net

TA012 - Poster Session

We invite submissions describing new experimental or theoretical work involving any aspect of electrophoresis technology at both the macro- and micro-scales. The posters will be up continuously for 3 days of the meeting. Prizes will be awarded for the top 3 submissions as determined by a panel of three distinguished judges. Chair: Victor Ugaz,
Texas A&M University, Email: ugaz@tamu.edu

Continued p6 (Co-sponsored session 15(

AND WHY NOT???

I am much indebted to the AES board and our newsletter editor, Dr. Nancy Kendrick, for their invitation to contribute to this issue. What a golden opportunity to reminisce, for electrophoresis was good to me!

Possibly to the surprise of some of my friends, I personally have never cast a single analytical gel of any kind. But, I really must have loved preparative aspects of electrophoresis. My first separations were in 1952, separating and testing slow and fast fractions of ovomucoid, using PerkinElmer modification of the Tiselius Nobel-prize winning cell (Arch. Biochem. Biophys. 37,491,1952). Later on, I used other commercial instruments, notably Kirkwood's electrophoresis - convection cell and LKB's isoelectric focusing and isotachophoresis columns. In the 1980s, at the Center for Separation Science we had also on loan the truly large scale Biostream apparatus, developed at the U.K. Atomic Energy Laboratory by Thompson and a free flow apparatus of the type pioneered by Dr. Hannig, courtesy of Dr. Weber.

True addiction arose when I obtained my first patent (U.S. 2,878,178, Mar. 17, 1959) for converting Kirkwood's electrophoresis -convection apparatus from batch to continuous flow separations. Essential to any separation is to have at least one inlet and two outlets – while Kirkwood's apparatus had only a top and bottom. Termed FFE (forced-flow electrophoresis) this was a uniquely powerful technique. Not funded was a proposal to develop a mobile pilot apparatus for water purification at the scale of 10,000 gallons/day. Instead, for some 15 years, the Veteran Administration supported my work on selective plasmapheresis – an in-vivo removal of gamma globulins from circulating blood in artificial kidney-like procedures. This electrophoretic blood treatment was applied to sheep and even horses, resulting in a modification of the immune response of the donor animal. Other experiments involved non-clogging electrofiltration.Since then, I designed several other devices, mostly employing isoelectric focusing and isotachophoresis. All operated in free solution, without gels or other anticonvective support media. My early objectives were large scale continuous flow processing. An irony of fate is that the only apparatus that became a commercial success was our smallest batch-type device. This is the Rotofor, which was licensed to and skillfully marketed by Bio-Rad. Fortuitously, the Rotofor is also benefiting from the current interest in proteomics, as an enrichment step prior to 2-D electrophoresis.

Seeing that small is beautiful, my last apparatus (U.S. Paten 6,793,791, Sept 21, 2004) aims at further reduction of the Rotofor priming volumes. Isoelectric focusing is carried out in a variable volume disposable rubber cell for volumes of 2-4 ml. The reduction in priming volume was achieved by avoiding the usual filter-press-like parallel compartmentalization in favor of tangential transport. The design should scale down to even smaller volumes. I am actively working to license this invention.

There is no way to hide my disappointment that electrophoretic techniques have not found any place in industrial downstream protein processing. There is no fundamental reason for this lack of appreciation, no theoretical explanation. Other electrical processes, such as electrolysis or electrodialysis are widely used. Nor was I alone, the patent and scientific literatures are full of ingenious design concepts. Obviously, neither I nor any of my colleagues were persuasive enough. We were basically steamrolled by chromatography. Electrophoretic processes are better understood theoretically than chromatography, but chromatography may be easier to implement.

I believe that it was also important that chromatography had the benefit of being the early focus of a highly competent manufacturer, Pharmacia. LKB Produkter of Bromma, Sweden, similarly adopted electrophoresis in its infancy, but made the willful decision not to enter the processing aspects. Pharmacia prospered and is now part of the giant GE, while LKB is no longer, much to the regret of many early electrophoreticists. Seeing the success of the Rotofor in the hands of Bio-Rad, I can only hope that one of these days a similarly seriously engaged company will revisit preparative electrophoresis. Isoelectric focusing and isotachophoresis are too powerful tools to be discarded.

Finally, I must express my appreciation for my many skilful and talented collaborators over the years, too many to mention individually. But, I owe special thanks to Garland Twitty, my work-companion for many years and to Wolf Thormann and Pier Giorgio Righetti, for their friendship and encouragements.

Milan Bier, March 2005
Tucson, AZ

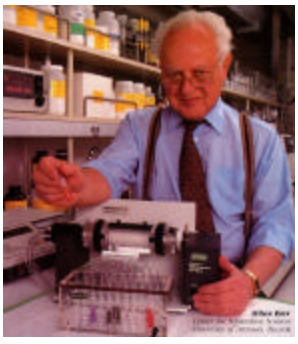

Photo of Dr. Bier with the Rotofor courtesy of Bio-Rad Laboratories, Inc.

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Newsletter subscriptions are complimentary with AES membership. For more information or to join contact Matt Hoelter at the address above.

Meeting program continued from page 4

15C11 New Developments in Microscale Separations for Biotechnology Applications (Co-sponsored with AIChE)

Microfluidic-based DNA and protein separation systems are beginning to emerge from the research laboratory and appear as commercially available products for use in a variety of biological applications, including genomic analysis. If sufficient miniaturization can be achieved, these microfabricated systems will enjoy a tremendous cost advantage over today's conventional macroscale systems, thereby ensuring a central role in future genomic analysis efforts such as the ambitious goal of sequencing a genome for $1,000 or less. Strategies to develop improved sieving media based on a variety of polymeric and nonpolymeric materials incorporating uniform and reproducible microstructures promise to generate tremendous improvements in the achievable level of separation performance. In addition, separation matrices composed of nanofabricated structures constructed directly on the surfaces of silicon, glass, and plastic substrates offer exciting possibilities in terms of exerting precise control over pore size and sieving properties. Novel techniques to analyze DNA and proteins by directly probing the motion of single molecules either through nanoscale fluidic channels or through membrane channel nanopores also show enormous potential. Chemical engineers continue to make important contributions in these areas, and we invite abstracts related to any aspect of the development or study of biomolecule separation technology at the microscale, or on miniaturized devices.

Chair: Victor M. Ugaz
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Co-Chair: James Schneider
Carnegie Mellon University
Email: schneider@cmu.edu

2004 Meeting Recap:

Our last annual meeting in Austin, Texas, Nov 7-11, 2004, was a good meeting in a good city. The dynamic Annelise Barron of Northwestern University organized the 11 sessions of the meeting as a topical in the larger AIChE gathering, once again demonstrating the success of this approach. The accompanying Poster Session was particularly rewarding; excellent posters were on display for most of the meeting, many by young researchers. A "Best Poster" competition was judged during a Tues evening reception featuring tasty appetizers and open bar for AES members. Meeting attendees also took advantage of the many fine restaurants and clubs in Austin, the walking path along the river, and the proximity of the State Capitol and the University of Texas campus. **A detailed meeting review " Electrophoresis in 2004: The Annual Meeting of the American Electrophoresis Society" is in the April, 2004, issue of the new journal Expert Review of Proteomics [Expert Rev. Proteomics 2(2), 2005, 157-164], available as a pdf file on the AES web site.**
www.aesociety.org/AES2004Review.pdf

The AES/AIChE joint meeting gave further evidence that the association between AES and AIChE has been fruitful and synergistic, fostering as it has an interdisciplinary approach toward refining electrophoretic methods. I look forward to an equally successful meeting in Cincinnati in the fall!

Dave Garfin,
President

Some Cincinnati Information: Cincinnati is situated in Southwestern Ohio on the majestic Ohio River and is home to the University of Cincinnati and 23,000 students. The Convention Center is located downtown near many good restaurants, and is connected to all major hotels by an enclosed skywalk. It is a 300,000 square foot facility with 35 meeting rooms and large exhibit space - plenty of room. The average Oct high temperature is 67 but this can vary in the late fall.