CONTACT: MATT HOELTER (SEE P4)

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AES NEWSLETTER

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

Please join us in downtown Philadelphia for AES's 25th anniversary meeting, Nov 17-20, 2008!

Everything is on schedule for the 2008 annual AES meeting to be held as Topical 3 of the American Institute of Chemical Engineers meeting in Philadelphia. Over 5000 scientists are expected to attend the 750 sessions of 21 Groups and 17 Topicals that comprise the AIChE meeting. The AES will have approximately 80 presentations plus a poster session. The location for all AES presentation sessions is Salon L at the Marriott Philadelphia Downtown. See the enclosed program grid for details. The poster session will be held at Exhibit Hall A of the Pennsylvania Convention Center. Details will be emailed to the poster presenters soon.

This year's meeting will feature a field trip to the Proteomics Core Facility at the University of Pennsylvania on Tuesday, November 18. This will take place between 3:15 PM and 5:45 PM. Admission to the tour is $20, payable by check to AES or by cash prior to the trip. The pick-up point for the tour will be the 12th street entrance of the Marriott Philadelphia Downtown and all attendees are requested to be at this location by 3:15 PM.

Please attend the annual business meeting on Wednesday, November 19 at 6:00 PM in Meeting Room 307 (Third Floor) Marriott Philadelphia Downtown. The Society needs your input. Ideas for session topics for next year will be welcome at the business meeting, as will volunteers to help with various items. Don't forget to sign up for the annual AES banquet that will follow the business meeting at 7:30 PM at Maggiano's Little Italy on 1201 Filbert Street.

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AES 2008 Meeting Co-Chairs

Scrutiny of Suspected Disease Biomarkers: An Opportunity for Lab-on-a-Chip Innovation

by Dr. Amy Herr, *University of California, Berkeley*

Limited success in translation of protein disease biomarkers to the diagnostic arena has emerged as a perplexing development of the last decade [1]. In spite of significant advances in proteomic technology, few new protein biomarkers have emerged from the proteomic discovery pool, progressed through the scrutiny of validation studies, and become incorporated in diagnostic tools [2, 3]. In a compelling analysis of the biomarker "pipeline" problem, Zolg [3, 4] boldly posits that the biomedical community has a tendency to overrate the biomarker discovery phase. In fact, he asserts, researchers under-appreciate another true challenge facing personalized medicine in the 21st century: the arduous task of developing and undertaking rigorous, candid assessments of biomarker candidates within carefully planned validation schemes. Without a concerted, cohesive effort to develop the instrumental infrastructure required for high-throughput, reproducible validation studies, the critical gap between biomarker discovery and translation of said biomarkers to clinical and point-of-care diagnostic tools remains [5].

Validation studies are essential for determining the statistically-verifiable diagnostic potential of suspected disease biomarkers – both as 'stand alone' and as multi-analyte diagnostic panels [6]. Researchers have recently speculated that biomarker validation may pose a greater challenge – and require more substantial innovation – than biomarker discovery. Several factors support this assertion, including [3]: (i) Conventional validation schemes can be more costly and labor-intensive than discovery endeavors. Yet the value of a promising biomarker rests on validation of the marker in the context of its intended use. (ii) Inherent to any validation undertaking is attrition of possible candidates – communication of negative results can be difficult and may attract limited attention from the community. Consequently, validation undertakings may be of limited interest to researchers. (iii) Tremendous innovation is sorely required to meet validation scheme design specifications. Key specifications include reducing the required labor necessary to complete a validation study, increasing throughput (number of samples from unique patients, as well as measurement of multiple analytes in a single sample), and providing reproducible protein quantitation.

In these challenges is a remarkable opportunity for decisive technological advances [7]. Of primary importance to protein biomarker validation studies is the unrivaled opportunity for ready integration of multiple sophisticated preparatory and analytical steps using microfluidic technology. Since the early 1990s interest has arisen regarding bioanalytical methods developed using microscale tools – key among the advantages of microfluidic approaches is the capability for integration of numerous functions. Integration and subsequent automation of sample preparation and analysis is advantageous for performing reproducible, quantitative measurements. As readers of the AES Newsletter know, electrophoretic handling and analysis are scale-depended transport mechanisms, making sample handling and analysis remarkably efficient in microfluidic formats [8-11]. Although disease biomarker validation has not benefited directly, microfluidically-enabled bioanalytical methods are emerging as rapid, reproducible core technologies for measurement of proteins in clinical samples. Recent reports describe lab-on-a-chip instruments that perform multiple operations in parallel in extra-laboratory settings (e.g., field-deployment, near-patient environments, resource-poor settings) [12-15].

Further, manipulation of small fluid volumes is readily performed with lab-on-a-chip tools, making preparation, handling, and analysis of previously inaccessible fluids and tissues with potentially rich protein content possible (e.g., prostatic fluid). Analysis of volume-limited diagnostic fluids – especially for multiple candidate biomarkers – would truly benefit from limited sample consumption. Volume-sparing analysis also enables study of tissues and fluids archived in patient sample registries – an absolute necessity for biomarker validation. While microfluidic methods are promising, significant innovation in streamlined sample preparation is required [16]. Although perhaps "unglamorous," sample preparation is an enormous challenge to reproducible biomarker validation data sets. Integration of preparatory functions enables dependable results as well as multiplexed assays (either by fluid type, patient identity, or biomarker) required in validation study design and implementation.

Critical technological hurdles associated with biomarker validation must be surmounted in new, more effective ways if we aim to stem the leaky pipeline between biomarker discovery and use of protein biomarkers to improve the human condition. Lab-on-a-chip methods – technologies that seamlessly integrate sample preparation and analysis – offer compelling advantages for realization of a shift from curative medicine to an envisioned ideal of predictive, personalized, preemptive medicine.

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Job Announcement: Postdoctoral Associate Position in Ultra-trace Cardiac Biomarker Detection

The School of Chemical Engineering and Bioengineering at Washington State University has a new opening for a postdoctoral researcher who will lead a team of graduate students in the development of a microfluidic platform for detection and quantitation of cardiac biomarkers from microliter blood samples. Support is available for a minimum of 2 years.

The preferred candidate will have advanced degrees in a Science and/or Engineering discipline with a strong record of publication and experience in one or more of the following areas: FRET, CE-LIF, and nonlinear electrophoresis, e.g., IEF/ITP, in microchips or capillaries. A working background in numerical simulations, multidimensional separations, optical detection and/or mass spectrometry is welcome, as is strength in chemistry and/or biochemistry.

Please mail or email your application, including a brief cover letter, resume, publication list, and two letters of recommendation, to: Prof. C. F. Ivory, School of Chemical Engineering and Bioengineering, Washington State University, Pullman, WA 99164-2710; cfivory@wsu.edu.

Washington State University is an equal opportunity/affirmative action employer

Don't miss two excellent reviews of the 2007 meeting:

1. Minerick, A.R., V.M. Ugaz, S. Murthy, J.P. Posner, "Review of Electrophoresis and BioMEMS in 2007: American Electrophoresis Society 24th Annual Meeting,"*J Capill Electrophor Microchip Technol*, Volume 10, Issue 5/6, Pages 101-109, 2008.

2. "Proteomics Review of the 2007 Meeting of the American Electrophoresis Meeting." Garfin, David, *Expert Reviews in Proteomics* 5: (8) 385-387, 2008. (go to www.expert-reviews.com or for a reprint, email reprints@expert-reviews.com

Travel Grant Awardees

The Meeting Co-Chairs, Shashi Murthy and Jonathan Posner, are pleased to announce the following travel awards of $500. These awards will be presented to the winners below at the meeting.

- Jennifer Pascal, Chemical Engineering, Tennessee Tech University, Cookeville, TN
- Jun Wang, Agricultural and Biological Engineering, Purdue University, West Lafayette, IN
- Fang Wang, Chemical Engineering, University Michigan, Ann Arbor, MI
- Aytug Gencoglu, Dave C. Swalm School of Chemical Engineering, Mississippi State University, MS State, MS
- Oxana Selivanova, Chemical Engineering, Carnegie Mellon University, Pittsburgh, PA
- Soumya Srivastava, Dave C. Swalm School of Chemical Engineering, Mississippi State University, MS State, MS
- Jia Ou, Department of Chemical Engineering, University of Minnesota, Minneapolis, MN
- John Osiri, Center for BioModular Systems, Louisiana State University, Baton Rouge, LA

Many Thanks to **Bio-Rad Laboratories** and **GE Healthcare,** whose sponsorship made eight travel grants possible in difficult financial times.

What unique connection does electrophoresis share with the city of Philadelphia?

The discovery in 1960 of a chromosomal abnormality associated with chronic myelogenous leukemia provided one of the first examples of a direct genetic signature of cancer malignancy. This abnormality became known as the Philadelphia chromosome in reference to its discovery at the University of Pennsylvania School of Medicine located in Philadelphia. The new insights that arose from this breakthrough helped change the course of cancer research by establishing a clear genetic link to disease. Gel electrophoresis methods played an instrumental role in helping unravel the nature of the translocation responsible for the chromosomal abnormality.

See: G.A. Koretzky. "The legacy of the Philadelphia chromosome." *JCI* 117 (2007): 2030-2032.

Membership Invitation

Please join the AES! Only $75 for the remainder of this *year plus all of 2009!* Contact Matt Hoelter at matt-aes@tds.net or fill out the registration form on our website www.aesociety.org

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Results of AES 2008 Election

Four positions were open for elections, President, Vice-President and two Councilor seats, and four members volunteered to run, so voting is unnecessary. We are once again lucky that our applicants, tapped by the council, are of the highest caliber. Their biosketches are below. They will be formally approved at the Philadelphia meeting in November.

Dr. Victor Ugaz
President Nov 2008
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Victor Ugaz: I am pleased to accept the position of AES President. I have been a faculty member in the Department of Chem Engineering at Texas A&M University since Jan 2003, where I am currently an Associate Professor. My academic background includes BS and MS degrees in Aerospace Engineering from the University of Texas at Austin, and a PhD in Chem Engineering from Northwestern. My current research interests center around harnessing the unique properties of micro-scale flow phenomena to develop new miniaturized components that can help enable biomedical assays to be performed more efficiently and inexpensively. As AES President, I will work to promote efforts in these emerging areas to help ensure that electrophoresis remains at the forefront of modern genomic analysis technology. I have served as co-chair of the 2005 and 2006 AES meetings in Cincinnati and San Francisco, as AES councilor from 2004-2006 and AES Vice-President since 2006.

Dr. Adrienne Minerick
Vice-President Nov 2008
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Adrienne Minerick has agreed to serve as Vice-President for the upcoming term. She is Assistant Professor and Director of the Medical micro-Device Engineering Research Laboratory (MD-ERL) in the Dave C. Swalm School of Chemical Engineering at Mississippi State University. She obtained a B.S in chemical engineering in 1998 from Michigan Technological University followed by a Ph.D. in 2003 from the Department of Chemical and Biomolecular Engineering at the University of Notre Dame. Her work in medical diagnostic microfluidics and electrokinetic blood dynamics has been focused on demonstrating reliable blood type identification within dielectro-phoretic microdevices. As AES Vice-President, she will work to increase the value and visibility of AES in the field of Electrokinetics. She was co-chair of the 2005 and 2006 AES meetings in Cincinnati and San Francisco, an AES councilor from 2004-2007, and has been Web Master since 2007.

Shashi Murthy
Councilor Nov 2008
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Shashi Murthy received his B.S. in chemical engineering from the Johns Hopkins University in 1999 and his Ph.D. in materials science and engineering from MIT. Following postdoctoral research in microfluidic cell separation at the Massachusetts General Hospital, he joined the faculty of Northeastern University as an Assistant Professor of chemical engineering in 2005. His major research interests are in microfluidic cell separation for applications in diagnostics and tissue engineering, and biomaterial coatings for neuroprosthetic devices. Shashi is co-chair of the 2008 meeting.

Dr. Neil Ivory
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Cornelius (Neil) Ivory received his B.S. in chemical engineering from the University of Notre Dame (1974) and a Ph.D. in chemical engineering from Princeton University (1980). Following a tour as Visiting Scientist in the bioseparations branch of NASA's Marshall Space Flight Center in Huntsville, Alabama, he moved to academia and presently teaches as Professor in the Chemical Engineering Department at Washington State University. His major research interests are in biological separations using electrophoresis and chromatography on microchips, nanochips and monoliths. Recent work includes the use of microfluidic chips for multidimensional separations. Neil was co-chair of the AES 2003 meeting and has been councilor from 2005-present.

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Members in the News: **AES's 2008 Meeting co-chair, *Shashi Murthy*, wins 2008 NSF Career Award!** His group at Northeastern University will study molecular-level phenomena at the surfaces of cells during separation processes in microfluidic devices. More information is available at www.aesociety.org/pubs/murthy_career.php

***Adrienne Minerick* "Perspectives" Article is featured in the September AIChE Journal.** The article discusses microfabricated laboratories on a chip to measure cellular and subcellular processes. See *AIChE Journal* 54: 9, pp2230-2237, Sept 2008.