

Welcome from the Chairs of MSB 2019

Welcome to the 35th International Symposium on Microscale Separations and Bioanalysis, MSB 2019! We are pleased to host you on the campus of Oregon State University, on the western edge of the fertile Willamette Valley of Oregon.

MSB began as the HPCE symposium in 1989, focused tightly on the emerging technology – High Performance Capillary Electrophoresis – that ultimately sequenced the human genome and enabled a revolution in molecular biology. The conference since has evolved into an annual interactive forum for the discussion of research on the frontiers of microscale separation science and bioanalysis. That was accompanied by a format change that has made this meeting more dynamic and inclusive, having a double-blind abstract review process that ensure the best science is presented. In keeping with this theme, MSB 2019 encompasses a range of microscale separations research, from fundamental technology development to high-impact applications in the fields of health, medicine, food, forensics, and the environment. The meeting begins with a series of short courses, which lead to an opening plenary session from a distinguished scientist. Each day is welcomed by another distinguished researcher, and the banquet evening is highlighted by an inspirational scientist who sets the bar for the evenings' discussion. We include oral presentations from young scientists, poster sessions and poster pitches to ensure that no research topic is left wanting for conversation.

In addition to our invited plenary and keynote presenters, we welcome more than 50 oral presentation selected via the double-blind review process. Half of the presenters are early career scientists – our goal is to set the stage for the future of microscale separations science, biomolecular analysis, and environmental analysis. Presentations are limited to taking about 60% of the allocated time, leaving ample opportunity for discussion of each presentation prior to advancing to the next talk.

We will keep the velocity high, the plate height low, the backpressure minimized and the selectivity tuned to allow for MSB 2019 to generate maximum efficiency and deliver only the best data quality

We will begin by thanking YOU for your valued contribution and your full participation and by thanking our sponsors for their generous support. It is all of you who make this event special and rewarding. Welcome!



Vince Remcho



Karen Waldron

Committees

MSB 2019 Programming Committee

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Oregon State University
Christopher Palmer,
University of Montana
Vincent Remcho (Chair),
Oregon State University
Jill Soth,
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Karen Waldron (Co-chair),
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Symposium History

Originally established as the *International Symposium on High Performance Capillary Electrophoresis (HPCE)*, the first event was held April 10-12, 1989, at the Park Plaza Hotel in Boston, MA. The meeting was founded by Professor Barry Karger from Northeastern University. This first meeting featured presentations discussing the principles of separation in capillaries under high electrical fields, including instrumentation development and applications, particularly in biotechnology.

The HPCE symposium was introduced at the moment when capillary electrophoresis (CE) branched off from the HPLC community, giving the technology the necessary focus at a time when CE instrumentation was first being commercialized. The symposium series was driven by the Scientific Advisory Board (SAB) under its diligent chairman Barry Karger until 2000, followed by Frantisek Svec. The series was organized world-wide by Prof. Karger until 2000, and after that by CASSS in the USA, and by separate bodies in Europe and Asia.

At HPCE 2004 in Salzburg, the SAB changed the symposium name to *MicroScale Bioseparations (MSB)*, since the attendees' interests expanded into the related techniques of micro- and nano-HPLC, microfluidic separations, and Lab-on-a-Chip applications, while the fascination with CE slowly decreased. The stylized logo was created at the same time, and captured the acronym MSB in a DNA helix motif given the prominent role that electrical driven microseparations have played in DNA sequencing and the early completion of the Human Genome Project. At MSB 2012 in Geneva, Switzerland, Beckman-Coulter established the prestigious Arnold O. Beckman Medal and Award for Outstanding Scientific Achievements in The Field of Electrodriven Separations Techniques which has become an essential element of the MSB series.

After the MSB 2012 symposium, the SAB changed. Not just by including new members, but especially by introducing new key concepts by which future meetings of the series will be organized. The symposium aims to create a confidential ambience with significant room for discussion and with over seventy percent of the program built from contributed abstracts using a blind review process. The board also changed its name to Strategic Program Committee (SPC). In order to further broaden the scope of the series to a wider range of scientists, the SPC approved the acronym of *MSB* to refer to *Microscale Separations and Bioanalysis*. The new official conference name was used for the first time at MSB 2016 in Niagara-on-the-Lake, Canada, and has been used since.

In January 2018, the SPC took the bold step of creating an official, incorporated society with the goal of ensuring the longevity of the MSB symposium series. Previous members of the SPC now form the Board of Directors of the *Society for Microscale Separations and Bioanalysis (SMSB)*.

Previous HPCE and MSB Meetings

Date	Location	Chairperson/s
1989	Boston	Barry L. Karger
1990	San Francisco	Barry L. Karger
1991	San Diego	James W. Jorgenson
1992	Amsterdam	Frans Everaerts
1993	Orlando	Barry L. Karger
1994	San Diego	Shigeru Terabe
1995	Würzburg	Heinz Engelhardt
1996	Orlando	Barry L. Karger
1997	Anaheim	William S. Hancock
1997	Kyoto	Shigeru Terabe
1998	Orlando	Barry L. Karger, S. Fanali
1999	Palm Springs	Edward S. Yeung
2000	Saarbrücken	Heinz Engelhardt
2001	Boston	Barry L. Karger, William S. Hancock
2002	Stockholm	Douglas Westerlund
2003	San Diego	Aran Paulus, Andras Guttman
2004	Salzburg	Wolfgang Lindner
2005	New Orleans	Michael Ramsey
2005	Kobe	Y. Baba, K. Otsuka
2006	Amsterdam	Gerard Rozing
2007	Vancouver	Robert Kennedy
2008	Berlin	Andreas Manz
2009	Boston	Jonathan V. Sweedler
2009	Dalian	Hanfa Zou
2010	Prague	Frantisek Foret
2011	San Diego	Annelise E. Barron
2012	Geneva	F. Kalman, G. Rozing, J-L Veuthey
2012	Shanghai	Rong Zeng
2013	Charlottesville	Jeff D Chapman, James P Landers
2014	Pécs	Ferenc Kilár, Attila Felinger, András Guttman
2015	Shanghai	Fukui Zhang, Pengyuan Yang, Norman Dovichi, Amy Y. Guo
2016	Niagara-on-the-Lake	Philip Britz-McKibbin, Karen Waldron, Sergey Krylov
2017	Noordwijkerhout	Rawi Ramautar, Govert Somsen
2018	Rio de Janeiro	Marina Tavares, Emanuel Carrilho
2019	Corvallis, Oregon	Vincent Remcho, Karen Waldron

SCIEX Microscale Separations Innovations Medal and Award

The SCIEX Microscale Separations Innovations Medal and Award (previously the Arnold O' Beckman Award) is an annual award given to an individual ***for current and breakthrough research in the field of electro-driven separations***, with particular consideration being given to the development of new methods, techniques and high-impact applications in the field. The award is supported by SCIEX, a key driver in capillary electrophoresis technology and comprises of a Medal, a Diploma and a \$5,000 cash prize.

Recipients are chosen by a selection committee made up of members from the SMSB Board of Directors that ranks the candidates according to the recommendation of peers and defined metrics (iCite from NIH). Evidence is presented for one or more of the following outstanding accomplishments:

- Conceptualization and development of unique instrumentation with an impact on electro-driven separations that has substantively advanced the field
- Development of novel and important electro-driven methods or methodologies with significant beneficial applications in analytical sciences
- Elucidation of fundamental phenomena involved in electro-driven separations
- The work being recognized is current, meaning only research and achievements of the past 5 years are considered.

The deadline for nomination is September 30th, to be considered for the following year's award. Nominations can be submitted at the MSB-Symposium Series website. All candidates are considered in the selection process. The awardee is announced in November of each year. The award is presented annually during the following International Symposium on Microscale Separations and Bioanalysis in a special Award Plenary Session followed by a lecture from the recipient. More information can be found at <http://www.msb-symposium.org/awards/sciex-award>.

2019 AWARDEE



SCIEX, a global leader in life science analytical technologies, has announced that the Society for Microscale Separations and Bioanalysis (SMSB) has selected **Dr. Aaron R. Wheeler**, Professor of Chemistry at the University of Toronto, as the recipient of the 2019 *SCIEX Microscale Separations Innovations Medal and Award for Current and Breakthrough Research in the Field of Electro-Driven Separations*. The Medal Ceremony will be on Wednesday, March 27, 2019, as part of a Special Award Plenary Session at the 35th *International Symposium on Microscale Separations and Bioanalysis (MSB 2019)* to be held on the campus of Oregon State University in Corvallis, Oregon.

Previous winners of the SCIEX Award and the Arnold O. Beckman Award

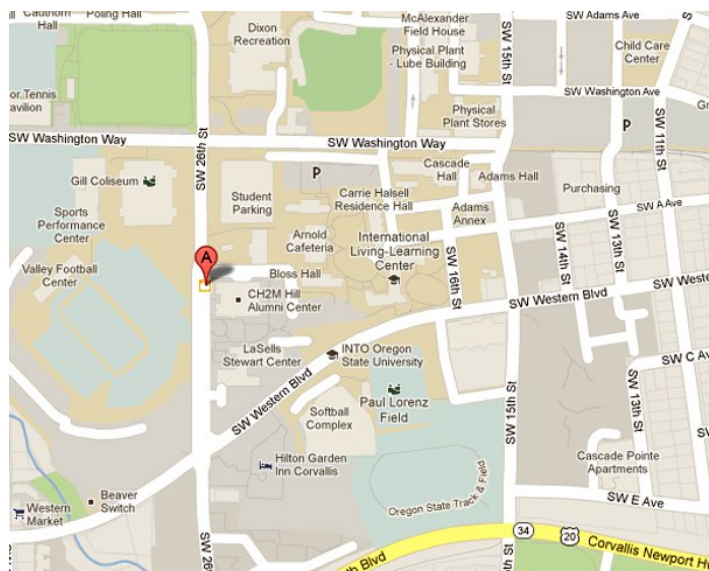
2018 Amy Herr
2017 Shigeru Terabe
2016 Bohuslav Gaš
2015 Gyula Vigh
2014 Barry Karger
2013 Stellan Hjertén
2012 Pier Giorgio Righetti

Venue for MSB 2019 and General Information

CH2M HILL Alumni Center, Oregon State University

725 SW 26th Street, Corvallis, Oregon 97331

<https://www.osualum.com/s/359/16/interior.aspx?sid=359&gid=1001&pgid=285>



- The Symposium Registration Desk will be open daily and is located in the foyer of the CH2M HILL Alumni Center.
- The opening plenary session on Monday, and the plenary lectures on Tuesday, Wednesday and Thursday will take place in the Cascade Ballroom C
- The oral sessions will be in Ballrooms A and B.
- Poster sessions, exhibitor table tops, and coffee breaks will be in the foyer.
- Science Café presentations will be in Cascade Ballroom C.

Delegate Badge

Your badge is required for admission to all events, rooms, halls and venues. Please wear your badge at all times.

Wireless Access

WiFi will be made available to all delegates. Passwords are indicated throughout the Conference Center.

Shuttle Buses to Airports

Portland International Airport (PDX) is the nearest international airport located 1.5 hours North of Corvallis. **Shuttle Service via Hut Airport Shuttle** is available every 90 minutes from Portland International Airport (PDX) and will take you directly to PDX from the OSU campus. Reservations are required and can be made online at www.portlandairportshuttle.com or by phone at (888) 257-0126. Adult rate one way is \$48.00.

Eugene (EUG) is the closest airport, located 45 minutes south of Corvallis with convenient connections to Seattle, San Francisco and Denver.

Shuttle Service is available via the Omni Shuttle, operating on-demand between the Eugene Regional Airport (EUG) and OSU. Advanced shuttle booking is required. For more information visit www.omnishuttle.com or call (800) 741-5097.

Social Program at MSB 2019

MSB recognizes that good science is all about strong interaction between people. Therefore, in addition to a comprehensive scientific program with active discussion, MSB 2019 will provide ample opportunities to build and strengthen social networks. All social events are included in with registration and open for each delegate. Join us and embrace the occasion to meet up with old friends and make new friendships.

All registered symposium participants and registered accompanying persons are kindly welcome to all social events.

Welcome Reception

CH2MHill Alumni Center, Oregon State University

Monday 25 March, 2019, 6pm

Refreshments, beverages and heavy hors d'oeuvres following the Opening Plenary Session by Prof. Dick Zare.

Conference Mixer

CH2MHill Alumni Center, Oregon State University

Tuesday 26 March, 2019, 7pm

Refreshments, beverages and heavy hors d'oeuvres following a day of scientific inspiration and conversation.

Conference Dinner

The Vue Restaurant, a panoramic event venue above downtown Corvallis, Oregon

Wednesday 27 March, 2019, 7pm

517 SW 2nd Street, Corvallis, OR 97330

<https://www.vuecorvallis.com>

Complete conference dinner with beverages following an inspirational evening lecture by Prof. Sue Lunte.

Farewell Cocktail

CH2MHill Alumni Center, Oregon State University

Thursday 28 March, 2019, 4:45pm

Light refreshments and beverages follow a motivational conference.

Science Café

**Attend the MSB 2019 Science Café
lunchtime presentations in
Cascade Ballroom C on Tuesday,
Wednesday and Thursday.**



Tuesday, March 26th

Presentation by *Hewlett-Packard Co.*

Presentation Topic TBD



Wednesday, March 27th

Presentation by *Valco*



**Visit Valco in the CH2MHill Alumni Center, adjacent to the Lobby, on
Wednesday for additional information or to arrange a private meeting. Hours are 8:30 to 17:00.**

VICI® is an acronym for **Valco Instruments Company Inc.** VICI now defines multiple companies which manufacture various products for the analytical industry: Injectors and valves; Fittings, Detectors; Valve actuation and accessories. For nearly 50 years, VICI Valco Instruments Co. Inc. has been the leading designer and manufacturer of standard and custom valves and fittings for precision analytical, biomedical, and biocompatible instrumentation. Our product line also includes a wide range of related products such as pneumatic and electric actuators, tubing and sampling loops, heated enclosures, valve sequence and temperature controllers, gas purifiers, GC detectors, and digital interfaces. VICI comprises six companies located around the world (Houston, Switzerland, Italy, Canada, Louisiana, and Washington), with over 325 employees at our company headquarters in Houston

Thursday, March 28th

Presentation by *908 Devices*



“Utilization of Microfluidic Chip Based Capillary Electrophoresis-ESI-MS for Rapid, Multi-level Analysis of Complex Molecules”

The ZipChip Platform is a front-end separation system for commercial mass spectrometers that directly couples high resolution separations to mass spectrometry analysis. Capillary electrophoresis (CE) has been demonstrated to be effective for analyzing complex biological samples, such as monoclonal antibodies (mAbs) and other protein based therapies. When interfaced with mass spectrometry (MS) analysis the integrated techniques present a powerful platform for characterizing biomolecules. Utilizing the ZipChip microfluidic technology to perform CE-MS analysis enables much faster and more efficient separations than can be achieved using capillary tubes as well as minimizing sample prep, buffer exchange and instrument maintenance.

**Visit 908 Devices in the CH2MHill Alumni Center, adjacent to the Lobby, on Thursday for
additional information or to arrange a private meeting. Hours are 8:30 to 17:00.**

MSB 2019 Scientific Program

**Monday, 25 March 2019, Linus Pauling Science Center
and CH2M HILL Alumni Center**

9:15 - 13:30	Check-In for Short Course* registrants: Lobby of the Linus Pauling Science Center	
SHORT COURSES - AM, Linus Pauling Science Center, OSU		
10:00 - 12:00	SC1 - Simul and PeakMaster: Applying Freeware Tools for Predicting and Understanding Electromigration Separations and Method Development <i>Bohuslav Gaš, Charles University in Prague</i>	Room LPSC 176
10:00 - 12:00	SC2 - Advanced CE-MS Approaches for Metabolomics <i>Rawi Ramautar, Leiden University, The Netherlands</i>	Room LPSC 178
10:00 - 12:00	SC3 - An Introduction to Electron Microscopy <i>Peter Eschbach, Oregon State University</i>	Room LPSC 145
12:15 - 13:15	LUNCH, Linus Pauling Science Center	
SHORT COURSES - PM, Linus Pauling Science Center, OSU		
13:30 - 15:30	SC4 - Paper-Based Analytical Devices <i>Charles Henry, Colorado State University</i>	Room LPSC 160
13:30 - 15:30	SC1 - Simul and PeakMaster: Applying Freeware Tools for Predicting and Understanding Electromigration Separations and Method Development <i>Bohuslav Gaš, Charles University in Prague</i>	Room LPSC 176
13:30 - 15:30	SC2 - Advanced CE-MS Approaches for Metabolomics <i>Rawi Ramautar, Leiden University, The Netherlands</i>	Room LPSC 178
13:30 - 15:30	SC3 - An Introduction to Electron Microscopy <i>Peter Eschbach, Oregon State University</i>	Room LPSC 145
15:30 - 15:50	COFFEE BREAK, CH2M HILL Alumni Center	
* A description of each short courses can be found in the last section of the program book.		
CH2M HILL Alumni Center		
16:00 - 20:00	Registration, Foyer of CH2M HILL Alumni Center	
PLENARY SESSION 1, Cascade Ballroom C		
17:00 - 17:15	Session Introduction and welcome to MSB 2019 Chairs: Vince Remcho, Oregon State University, and Karen Waldron, University of Montreal	
17:15 - 18:00	Microdroplet Chemistry <i>Richard N. Zare, Stanford University, USA</i>	
18:00 - 20:30	WELCOME RECEPTION, CH2M HILL Alumni Center	

Tuesday, 26 March 2019, CH2M HILL Alumni Center

8:00 - 16:30	Registration , Foyer of CH2M HILL Alumni Center	
PLENARY SESSION 2, Cascade Ballroom C		
8:25 - 8:30	Session Introduction Chair: <i>Jeff Chapman, MicroGEM, USA</i>	
8:30 - 9:10	DNA FORENSICS at the Intersection of Bioseparations, Engineering and Molecular Biology <i>James P. Landers, University of Virginia, USA</i>	
	Cascade Ballroom A	Cascade Ballroom B
	DEVELOPMENTS AND APPLICATIONS IN ELECTROKINETIC SEPARATIONS	PRECLINICAL AND CLINICAL BIOANALYSIS
9:15 - 9:20	Session Introduction <i>Chair: Chris Palmer, University of Montana, USA</i>	Session Introduction <i>Chair: Kevin Schug, University of Texas Arlington</i>
9:20 - 9:50	KN01 - Frontal continuous capillary electrophoresis to study complex (macro)molecular interactions <i>Hervé Cottet, Université de Montpellier 2, France</i>	KN02 - Chromatography in clinical diagnostics; selectivity at scale, specifically <i>Russ Grant, Lab Corp of America, USA</i>
9:50 - 10:10	OR01 - Immuno-CE as a powerful tool for biomarker analysis: from conception to application for Alzheimer's disease molecular diagnosis <i>Myriam Taverna, Université Paris-Sud, France</i>	OR06 - A proteomic based exosomal biomarker signature reveals significant heterogeneity in metastatic prostate cancer patients: implications for precision clinical laboratory testing <i>Alex Rai, Columbia University, USA</i>
10:10 - 10:30	OR02 - Enantioselective isotachopheresis of methadone with sulfated beta cyclodextrin as chiral selector YS <i>Saara Mikkonen, KTH Royal Institute of Technology, Stockholm, Sweden</i>	OR07 - Metabolic phenotyping of mitochondrial ferritin overexpressing mouse by LC/MS/MS <i>Ruth Gordillo, University of Texas Southwestern Medical Center, USA</i>
10:30 - 10:50	COFFEE BREAK Foyer of CH2M HILL Alumni Center	
10:50 - 11:10	OR03 - Exploring the potential of predictable dynamic EOF reversal <i>Christopher Harrison, San Diego State University, USA</i>	OR08 - A novel method for diagnosing Alzheimer's disease based on Raman Hyperspectroscopy YS <i>Nicole Ralbovsky, SUNY Albany, USA</i>
11:10 - 11:30	OR04 - Tunable and pH-independent electroosmotic flow for application in CE and CE-MS <i>Dusan Koval, IOCB Prague, Czech Republic</i>	OR09 - Ultrasensitive detection of protein biomarkers in clinical samples by Ambient Mass Spectrometry Immunoassays <i>Huwei Liu, Peking University, China</i>

11:30 - 11:50	OR05 - Field-effect electroosmotic flow patterning as a mechanism for diffusion-based separation YS Vesna Bacheva, Technion - Israel Institute of Technology, Isreal	OR10 - High throughput screening of serum fatty acids by multisegment injection-Nonaqueous-Capillary Electrophoresis-Mass Spectrometry Philip Britz-McKibbin, McMaster University, Canada
11:50 - 13:00	SCIENCE CAFÉ LUNCH , Cascade Ballroom C “The Intellectual Property Development and Licensing Process” Sponsored by: OSU Office for Commercialization and Corporate Development	
13:00 - 13:30	POSTER PITCHES , Cascade Ballroom C Chair: Chris Palmer, University of Montana	
13:30 - 14:35	POSTER SESSION 1 , Foyer of CH2M HILL Alumni Center Posters P-T-01 to P-T-15	
	Cascade Ballroom A	Cascade Ballroom B
	MULTIDIMENSIONAL SEPARATIONS	ELECTROCHEMICAL MICROANALYTICAL DEVICES
14:35 - 14:40	Session Introduction Chair: Michael Breadmore, University of Tasmania, Australia	Session Introduction Chair: Nadmudda Rodthongkum, Chulalongkorn University, Thailand
14:40 - 15:10	KN03 - Modulation approaches for 2-dimensional chromatography Emily Hilder, University of Tasmania, Australia	KN04 - Active digital microfluidic paper chips for the Point-of Care biomedical application Kwanwoo Shin, Sogang University, Seoul, Korea
15:10 - 15:30	OR11 - On-line multiplexed multidimensional capillary electrophoresis separations of complex biological samples Cameron Skinner, Concordia University, Canada	OR18 - Disposable screen-printed electrode modified with ionic-liquid/graphene composite for determination of rapamycin Orawon Chailapakul, Chulalongkorn University, Thailand
15:30 - 15:50	OR12 - Two dimensional separation of plasma lipoproteins by combined asymmetrical flow field-flow fractionation and capillary zone electrophoresis YS Kevin Bierbaum, Center for Disease Control and Prevention, USA	OR19 - Glassy carbon microparticle stencil-printed electrodes for heavy metal detection and human health monitoring YS Alyssa Kava, Colorado State University, USA
15:50 - 16:10	OR13 - Iteration problem in alignment program Curfit2D solved Wim de Boer, The Netherlands	OR20 - Label free enzyme sorting using droplet microfluidics YS Samuel Braza, Santa Clara University, USA
16:10 - 16:35	COFFEE BREAK Foyer of CH2M HILL Alumni Center	

	Cascade Ballroom A	Cascade Ballroom B
	ROLE OF SAMPLE PREPARATION IN CHEMBIOANALYSIS: BEATING GIGO (GARBAGE IN - GARBAGE OUT)	MICROSCALE SYSTEMS FOR HUMAN AND ENVIRONMENTAL HEALTH MEASUREMENTS
16:35 - 16:40	Session Introduction <i>Chair: Marc Porter, University of Utah, USA</i>	Session Introduction <i>Chair: Charles Henry, Colorado State University, USA</i>
16:40 - 17:10	KN05 - Sample pretreatment: A prerequisite for effectively detecting lipoarabinomannan in urine and serum from active TB patients <i>Delphi Chatterjee, Colorado State University, USA</i>	KN06 - Paper-based electroanalytical platforms for bioanalytical and environmental monitoring <i>Frédérique Deiss, Indiana University – Purdue University Indianapolis, USA</i>
17:10 - 17:30	OR14 - Novel fluoroalcohol induced aqueous two-phase systems (FATPS) for microextraction, fractionation, and enrichment of samples in proteomics, lipidomics, and environmental analysis <i>Morteza Khaledi, The University of Texas at Arlington, USA</i>	OR21 - HP advanced microfluidic and applications <i>Alex Govyadinov, HP Inc., USA</i>
17:30 - 17:50	OR15 - Nanowell-mediated multidimensional separations combining nanoLC with SLIM IM-MS for rapid, high-peak-capacity proteomic analyses YS <i>Maowei Dou, Pacific Northwest National Laboratory, USA</i>	OR22 - Biomolecule concentration and separation by microfluidic free-flow isotachophoresis <i>Zachary Gagnon, Texas A&M University - College Station, USA</i>
17:50 - 18:10	OR16 - DNA sample preparation for long-read genomics using microfluidics YS <i>Paridhi Agrawal, University of Minnesota, USA</i>	OR23 - Hybrid plasmonic nanomaterials for the separation and detection of heavy metals <i>Amanda Haes, University of Iowa, USA</i>
18:10 - 18:30	OR17 - Single cell proteome mapping of tissue heterogeneity using microfluidic nanodroplet sample processing and ultrasensitive LC-MS YS <i>Ying Zhu, Pacific Northwest National Laboratory, USA</i>	OR24 - Silver nanoparticle-modified, nanostructured diatom biosilica monolayers for on-chip UTLC separation and SERS detection functionalities YS <i>Joseph Kraai, Oregon State University, USA</i>
18:00 - 20:30	CONFERENCE MIXER, CH2M HILL Alumni Center	

Wednesday, 27 March 2019, CH2M HILL Alumni Center

8:00 - 16:30	Registration, Foyer of CH2M HILL Alumni Center	
PLENARY SESSION 3, Cascade Ballroom C		
8:15 - 8:20	Session Introduction Chair: Jörg Kutter, President of the Society for Microscale Separations and Bioanalysis	
8:20 - 8:30	Presentation of SCIEX Award Hans Dewald, Senior Marketing Manager – Americas, SCIEX	
8:30 - 9:10	Portable Digital Microfluidic Assays: from Bench to Field Aaron Wheeler, University of Toronto, Canada	
	Cascade Ballroom A	Cascade Ballroom B
	NOVEL DETECTION METHODS FOR MICROSEPARATIONS	MICROSCALE SEPARATIONS IN ANALYSIS OF INTACT PROTEINS AND PROTEIN COMPLEXES
9:15 - 9:20	Session Introduction Chair: Amanda Haes, University of Iowa, USA	Session Introduction Chair: Alexander Ivanov, Northeastern University, USA
9:20 - 9:50	KN07 - Raman Hyperspectroscopy for forensic purposes and medical diagnostics Igor Lednev, University at Albany – SUNY, USA	KN08 - Microchip CE-ESI-MS: characterization of molecular boulders Michael Ramsey, University of North Carolina at Chapel Hill, USA
9:50 - 10:10	OR25 - Microdialysis sampling for in situ measurement of quorum sensing from biofilms and immune system physiology Julie Stenzen, University of Arkansas, Fayetteville, USA	OR29 - Protein complexes in hematopoiesis and leukemia Jarrod Marto, Dana-Farber Cancer Institute, Harvard University, USA
10:10 - 10:30	COFFEE BREAK Foyer of CH2M HILL Alumni Center	
10:30 - 10:50	OR26 - Single molecule surface enhanced Raman and fluorescence using liposome-based substrates Laura Sagle, University of Cincinnati, USA	OR30 - Resolving protein conformational states with hybrid trapped ion mobility spectrometry-high resolution mass spectrometry YS Robert Voeten, Vrije Universiteit Amsterdam, The Netherlands
10:50 - 11:10	OR27 - Development of a label-free direct detection small-molecule second harmonic generation immunoassay John Conboy, University of Utah , USA	OR31 - Narrow open tubular liquid chromatography (NOTLC): is it a new paradigm in high-resolution separation? □ Shaorong Liu, University of Oklahoma, USA
11:10 - 11:30	OR28 - Noninvasive, label-free bioanalysis at subcellular resolution using hyperspectral stimulated Raman scattering imaging Dan Fu, University of Washington, USA	OR32 - Improving microfluidic-based separation systems for monitoring cellular secretions YS Weijia Leng, Florida State University, USA
11:30 - 12:20	SCIENCE CAFÉ LUNCH, Cascade Ballroom C	

Sponsored by: VALCO

- 12:20 - 12:50 **POSTER PITCHES**, Cascade Ballroom C
Chair: Chris Palmer, University of Montana
- 12:50 - 13:55 **POSTER SESSION 2**, Foyer of CH2M HILL Alumni Center
Posters P-W-16 to P-W-33

Cascade Ballroom A

ANALYSIS OF PHARMACEUTICALS & CHIRAL COMPOUNDS

- 13:55 - 14:00 **Session Introduction**
Chair: Apryll Stalcup, Dublin City University, Ireland
- 14:00- 14:30 **KN09 - Chiral separations at the speed of sensors and the concept of peak processing**
M. Farooq Wahab, University of Texas at Arlington, USA
- 14:30 - 14:50 **OR33 - Nanogel electrophoresis: tunable separations to rapidly and inexpensively quantify antibody glycosylation**
Lisa Holland, West Virginia University, USA
- 14:50 - 15:10 **OR34 - 12 year's experience of low-cost analytical device based on capillary electrophoresis for falsified or sub-standard drug quality control**
Serge Rudaz University of Geneva Switzerland
- 15:10 - 15:30 **OR35 - Development of eigenzones in Electrokinetic Capillary Chromatography (EKC) systems**
YS *Michal Maly, Charles University, Czech Republic*

Cascade Ballroom B

APPLICATIONS IN FORENSIC SCIENCES AND FOOD-BEVERAGE-NUTRITION ANALYSES

- Session Introduction**
Chair: Isabelle Kohler, Leiden University, The Netherlands
- KN11 - Rapid screening of inorganic explosives**
Michael Breadmore, University of Tasmania, Australia
- OR40 - Detection of explosive compounds via MEKC on native polymeric microdevice**
YS *Charles Clark, University of Virginia, USA*
- OR41 - Simultaneous detection of elaidic and vaccenic trans fatty acid isomers by CZE-UV** $\square$ *Marcone de Oliveira, UFJF, Brazil*
- OR42 - Serotonin, tryptophan and 5-hydroxytryptophan determination by capillary electrophoresis with capacitively coupled contactless conductivity detection (CE-C4D)**
José Alberto Fracassi da Silva, State University of Campinas, UNICAMP, Brazil

15:30 - 15:45

COFFEE BREAK

Foyer of CH2M HILL Alumni Center

Cascade Ballroom A		Cascade Ballroom B	
INNOVATIONS IN MICROSEPARATIONS: UNIQUE MECHANISMS OF TRANSPORT		BIOPHARMACEUTICAL AND BIOMOLECULE ANALYSIS	
15:45 - 15:50	Session Introduction <i>Chair: Lisa Holland, West Virginia University, USA</i>	15:45 - 15:50	Session Introduction <i>Chair: Myriam Taverna, Université Paris Sud, France</i>
15:50 - 16:20	KN10 - Tunable guanosine biogels for molecular solubilization and manipulation <i>Linda B. McGown, Rensselaer Institute of Technology, USA</i>	15:50 - 16:20	KN12 - Capillary HILIC-MS for selective and sensitive protein analysis <i>Govert Somsen, Vrije Universiteit Amsterdam, The Netherlands</i>
16:20 - 16:40	OR36 - Proteome analysis using micro pillar array columns (μPAC™) <i>Aran Paulus, Thermo Fisher Scientific, USA</i>	16:20 - 16:40	OR43 - Capillary electrophoresis based enzyme assays: application to complex media and functionalized gold nanoparticles □ YS <i>Reine Nehmé, Université Orléans, France</i>
16:40 - 17:00	OR37 - Nano scale layered structures (NSLS) for separation <i>Brian Richardson, USA</i>	16:40 - 17:00	OR44 - High-sensitivity glycan profiling of human blood-derived isolates of extracellular vesicles using capillary zone electrophoresis-mass spectrometry YS <i>Anne-Lise Marie, Northeastern University, USA</i>
17:00 - 17:20	OR39 - Utilization of second cross over frequency as a correlation factor for uptake of light rare earth elements (REEs) by Cupriavidus Necator YS <i>Anthony Giduthuri, University of Idaho, USA</i>	17:00 - 17:20	OR45 - Development of a top-down quantitative method for determination of intact growth factor proteins from biological samples using liquid chromatography YS <i>Katarina Marakova, University of Texas at Arlington, USA</i>
17:20 - 17:40	OR38 - High resolution separations of neural stem and progenitor cells <i>Mark Hayes, Arizona State University, USA</i>		
PLENARY SESSION 4, Cascade Ballroom C			
17:45 - 17:50	Session Introduction <i>Chair: Vince Remcho, Oregon State University, USA</i>		
17:50 - 18:30	Applications of Microchip Electrophoresis to Cell Analysis and <i>in vivo</i> Monitoring <i>Susan Lunte, University Kandas, USA</i>		
19:00 - 22:00	CONFERENCE DINNER The Vue Restaurant		

Thursday, 28 March 2019, CH2M HILL Alumni Center

8:00 - 12:00	Registration , Foyer of CH2M HILL Alumni Center	
PLENARY SESSION 5 , Cascade Ballroom C		
8:25 - 8:30	Session Introduction Chair: Karen C. Waldron, University of Montreal, Canada	
8:30 - 9:10	Capillary Electrophoresis Improves Metagenomic Analysis of an Environmental Microbiome <i>Norman J. Dovichi, University of Notre Dame, USA</i>	
	Cascade Ballroom A	Cascade Ballroom B
	MICROFLUIDIC SYSTEMS INNOVATIONS	ADVANCES IN INSTRUMENTATION, DESIGN, AND APPLICATIONS OF BIOSENSORS
9:15 - 9:20	Session Introduction <i>Chair: Vince Remcho, Oregon State University, USA</i>	Session Introduction <i>Chair: José Alberto Fracassi da Silva, Universidade Estadual de Campinas, Brazil</i>
9:20 - 9:50	KN13 - Development of porous materials-based microfluidic devices <i>Elain Fu, Oregon State University Chemical Engineering, USA</i>	KN16 - 3D printed microfluidic devices for preterm birth biomarker analysis <i>Adam T. Wooley, Brigham Young University, USA</i>
9:50 - 10:10	OR46 - Induced aggregation enhances platelet depletion in acoustic blood separation <i>Jason Fiering, Draper Inc., USA</i>	OR56 - Uncovering cellular senescence in aging models via mass cytometry YS <i>Daniel Roncancio, University of Minnesota, USA</i>
10:10 - 10:30	COFFEE BREAK Foyer of CH2M HILL Alumni Center	
10:30 - 10:50	OR47 - Low-cost, portable, fully automated ion chromatography system with 235 nm UV-LED based microfluidic optical detector for in-situ monitoring of nitrite YS <i>Eoin Murray, T.E. Laboratories Ltd., Ireland</i>	OR57 - Target-triggered DNA motors and their applications to biosensing <i>Hongquan Zhang, University of Alberta, Canada</i>
10:50 - 11:10	OR48 - Enhancing single cell assays on microfluidic devices using optical fiber bridges for the analysis of reactive nitrogen species and kinases in immune system cells <i>Christopher Culbertson, Kansas State University, USA</i>	OR58 - Investigation of SERS potential to detect proteins within adducts at an ultralow concentration YS <i>Lamyaa Almehmadi, SUNY Albany, USA</i>
11:10 - 11:30	OR49 - Real-time measurement of glucose consumption from hepatocytes using an integrated analytical platform YS <i>Anna Adams, Florida State University, USA</i>	OR59 - Novel platform of electrochemical lactate sensor using PtNPs/PANI/MXene nanocomposites <i>Nadnudda Rodthongkum, Chulalongkorn University, Thailand</i>

11:30 - 12:35		SCIENCE CAFÉ LUNCH, Cascade Ballroom C Sponsored by: 908 Devices Utilization of Microfluidic Chip Based Capillary Electrophoresis-ESI-MS for Rapid, Multi-level Analysis of Complex Molecules”	
	Cascade Ballroom A		Cascade Ballroom B
	DIELECTROPHORESIS AND CELL SORTING		ADVANCED –OMICS APPROACHES: EXTRACTING MORE INFORMATION USING LESS (SAMPLE, TIME,...)
12:35 - 12:40	Session Introduction <i>Chair: Mark Hayes, Arizona State University, USA</i>		Session Introduction <i>Chair: Rawi Ramautar, Leiden University, The Netherlands</i>
12:40 - 13:10	KN14 - Label-free sorting of neural stem cells using dielectrophoresis <i>Lisa A. Flanagan, University of California Irvine, USA</i>		KN17 - Proteomics and metabolomics of single embryonic cells by microanalytical CE-MS <i>Peter Nemes, University of Maryland, USA</i>
13:10 - 13:30	OR50 - Perspectives on selected dielectrophoresis platforms for particle separation <i>Rodrigo Martinez-Duarte, Clemson University, USA</i>		OR60 - Improved analytical strategies for proteomic profiling of limited samples using microscale separations coupled to mass spectrometry <i>Alexander Ivanov, Northeastern University USA</i>
13:30 - 13:50	OR51 - cellPhoresis: A dielectrophoresis based technique for rapid, nondestructive cell separation and analysis <i>Aytug Gencoglu, CBio, USA</i>		OR61 - Optimization of fabric phase sorptive extraction for metabolomics-based biodosimetry of irradiated whole blood YS <i>Shoichiro Sueoka, University of Arizona, USA</i>
13:50 - 14:10	OR52 - Label-free platform for sorting enzymes and cells <i>Paul Abbyad, Santa Clara University, USA</i>		OR62 - Getting more information from less samples: a new algorithm for analysis of omics data in multifactorial experimental designs YS <i>Victor González-Ruiz, University of Geneva, Switzerland</i>
14:10 - 14:25		COFFEE BREAK Foyer of CH2M HILL Alumni Center	
	Cascade Ballroom A		Cascade Ballroom B
	BIOANALYTICAL DEVICES FOR PRECISION HEALTH APPLICATIONS		CE-MS: ADVANCES AND APPLICATIONS
14:25 - 14:30	Session Introduction <i>Chair: Elain Fu, Oregon State University Chemical Engineering, USA</i>		Session Introduction <i>Chair: Karen C. Waldron, University of Montreal, Canada</i>
14:30 - 15:00	KN15 - Point-of-care testing for individualized HIV management <i>Barry Lutz, University of Washington Bioengineering, USA</i>		KN18 - Top down analysis of protein structural variation and structural dynamics with CE directly coupled to HRMS

		<i>David DY Chen, University of British Columbia, Canada</i>
15:00 - 15:20	OR53 - Smart polymer reagents for bioprocessing and in vitro diagnostics <i>James Lai, University of Washington, USA</i>	OR63 - Unleashing the power of CE to characterize snake venoms <i>Rob Haselberg, Vrije Universiteit Amsterdam, The Netherlands</i>
15:20 - 15:40	OR54 - Wicking microfluidic approach to separate blood plasma from whole blood to facilitate downstream assays YS <i>Chandima Bandara, Oregon State University, USA</i>	OR64 - CE-IM-MS: are μ_{eff} and CSS correlated or orthogonal? YS <i>Nicolas Drouin, Leiden University, The Netherlands</i>
15:40 - 16:00	OR55 - A paper-based electrokinetic system for single-step nucleic acid extraction from human serum YS <i>Andrew Bender, University of Washington, USA</i>	OR65 - Assessing the actual utility of capillary electrophoresis-mass spectrometry for metabolic profiling of human plasma YS <i>Wei Zhang, Leiden University, The Netherlands</i>
AWARDS SESSION and FINAL REMARKS, Cascade Ballroom C		
16:10 - 16:30	Young Scientist (YS) Oral Presentation Award, Elain Fu (Oregon State University) Poster Awards, Chris Palmer (University of Montana)	
16:30 - 16:40	Invitation to MSB 2020, Myriam Taverna (Université Paris Sud) and Serge Rudaz (University of Geneva)	
16:40 - 16:50	Closing Ceremony, Vince Remcho and Karen Waldron	
16:50 - 18:00	Farewell Cocktail	

Young Scientist Award

The MSB 2019 Young Scientist Award is intended to give talented young scientists extra encouragement. It will be presented to a young researcher whose outstanding work sets an example for other scientists. All presenters of an oral contribution who are less than 35 years of age at the time of their lecture are eligible for consideration. An international jury of both young and mature scientists will judge the qualified presentations and choose a winner. The prize consists of a certificate and a cash amount donated by IONBENCH. The winner will be announced and the prize awarded during the Awards Session/Closing Ceremony on Thursday, March 28th.

Best Poster Award

All posters presented at MSB 2019 will be considered for an MSB 2019 Poster Award. The posters will be reviewed by an international panel of scientists and ranked based on Novelty and originality of the work, creativity and potential for innovation; Scope of work, technical quality of experimental design, and execution of experiments; Readability of the presentation and author's explanations. Poster awards comprise cash prizes for the 4 best posters (made available by SCIEX and by the CCCTA - Centre de Compétence en Chimie et Toxicologie Analytiques, a Swiss association supporting analytical chemistry in Switzerland and France). Runners-up will receive book vouchers (made available by the journal Analytical Bioanalytical Chemistry) or journal subscriptions (made available from The Royal Society of Chemistry). The winners will be announced and the prizes awarded during the Awards Session/Closing Ceremony on Thursday, March 28th.

MSB 2019 Program – Poster Presentations

Poster Session 1

**Tuesday, 26 March 2019, Foyer of CH2M HILL Alumni Center
(13:30 - 14:35)**

ADVANCES IN INSTRUMENTATION, DESIGN AND APPLICATIONS OF BIOSENSORS

- P-T-01 Cortisol Detection Using Quantum Dot-Aptamer Probes**
Larry Cheng, Oregon State University, USA
- P-T-02 Quantum Dot-Fullerene Based Molecular Beacons for Highly Sensitive DNA Detection**
Larry Cheng, Oregon State University, USA
- P-T-03 Optofluidic pipette device for filter-free fluorescence-based biosensing**
Larry Cheng, Oregon State University, USA
- P-T-04 An online fluorescence anisotropy immunoassay for real-time profiling of islet of Langerhans secretions**
Joel Adablah, Florida State University, USA
- P-T-05 Electrospray deposition of discrete biological materials for bioanalysis**
Matthew Kremer, Oregon State University, USA

BIOANALYTICAL DEVICES FOR PRECISION HEALTH APPLICATIONS

- P-T-06 Extracorporeal Microfluidic Photoreactor for Treatment of Hyperbilirubinemia in Neonates**
Ryan Faase, Oregon State University, USA
- P-T-07 Electronically addressable wax-based phase-change valve for fabric-based microfluidic devices**
Corey Downs, Oregon State University, USA

ELECTROCHEMICAL MICROANALYTICAL DEVICES

- P-T-08 Development of a non-enzymatic paper-based sensor for creatinine detection**
Sirprapa Boopphahom, Oregon State University, USA
- P-T-09 Multi-functional Scanning Electrochemical Microscopic Probes to Monitor Bacterial Metabolic Activity**
Nadeeshani Jayathilake, Oregon State University, USA

INNOVATIONS IN MICROSEPARATIONS: UNIQUE MECHANISMS OF TRANSPORT AND FLUID CONTROL

- P-T-10 Fluid collection off of a Janus-type wicking-capillary microfluidic device**
Lindsay Unitan, Oregon State University, USA

MICROFLUIDIC SYSTEMS INNOVATIONS

- P-T-11 Chloroform compatible, thiol-ene based replica molded micro chemical devices as an alternative to glass microfluidic chips**
Jörg Kutter, University of Copenhagen, Denmark
- P-T-12 Simulation, Fabrication, and Characterization of Microfluidic-based Microdialysis Devices**
Patrick Pysz, University of Arkansas, Fayetteville, USA

NOVEL DETECTION METHODS FOR MICROSEPARATIONS

- P-T-13 Investigating polymerase elongation of DNA with fluorescently labeled nucleotides as a sensitive readout for single-cell immunoblotting**
Aiden Moss, University of California, Berkeley, USA

- P-T-14 **Interpreting Raman Spectra of Uranyl Species for Understanding Human Disease**
Junnan Wang, University of Iowa, USA
- P-T-15 **Experimental and theoretical development of bipolar electrochemistry-fluorescence-based detection system for microchip electrophoresis**
Manjula Wijesinghe, University of Kansas, USA

Poster Session 2

**Wednesday, 27 March 2019, Foyer of CH2M HILL Alumni Center
(12:50 - 13:55)**

ADVANCED - OMICS APPROACHES: EXTRACTING MORE INFORMATION USING LESS (SAMPLE, TIME, ...

P-W-16 TBA

BIOPHARMACEUTICAL AND BIOMOLECULE ANALYSIS

- P-W-17 **pI Markers in Capillary Isoelectric Focusing - Determination of Physical-Chemical Properties**
Martin Ansorge, Charles University, Czech Republic
- P-W-18 **Evaluation of the antioxidant capacity of phlorotannins from *Fucus vesiculosus* hydroethanolic extracts in the frame of the i.Film project**
Mariana, Andrade, National Institute of Health Doutor Ricardo Jorge, Portugal
- P-W-19 **Optimization of carrier for effective miRNA extraction method from plasma**
Young Sook Yoo, Korea Institute of Science Technology, Korea
- P-W-20 **Measurement of neuronal glutathione levels in the brain**
Koji Aoyama, Teikyo University School of Medicine, Japan

DEVELOPMENTS AND APPLICATIONS IN ELECTROKINETIC SEPARATIONS

- P-W-21 **Characterization of PHMB as a dynamic capillary coating for fused silica capillaries**
Jessica Torres, San Diego State University, USA
- P-W-22 **Online Method for Analyte Focusing at pH Boundary Induced by System Zone in Capillary Zone Electrophoresis**
Milan Boublik, Charles University, Czech Republic
- P-W-23 **Development of Nanodisc Affinity Capillary Electrophoresis to Characterize Cytochrome C Interactions with Lipid Bilayers Comprising Cardiolipin**
Bethany Shelter, University of Montana, USA

DIELECTROPHORESIS AND CELL SORTING

- P-W-24 **3D Carbon- electrode dielectrophoresis to identify *Candida* strains**
Cora Bisbee, Clemson University, USA
- P-W-25 **A Method to Rapidly Characterize the Dielectrophoresis response of Numerous Single Cells to Determine the distribution of Dielectric Properties in the Population**
Devin Keck, Clemson University, USA
- P-W-26 **A microfluidic ratchet for sub-micrometer (bio)particle separation**
Dai Hyun Kim, Arizona State University, USA
- P-W-34 **Biophysical Characterization of Several Strains of *Salmonella* towards Serotyping**
Brennan Copp, Arizona State University, USA

APPLICATIONS IN FORENSIC SCIENCES AND FOOD/BEVERAGE/NUTRITION ANALYSES

P-W-27 Development and automation of a fully-integrated rotationally-driven microdevice for dynamic solid phase extraction (dSPE) of PCR-ready DNA from forensic samples

Leah Dignan, University of Virginia

P-W-28 Separation of Water & Fat soluble vitamins using single HPLC analysis method

Nagarajan Vaithiyanathan, Intek Chromasol, India

ROLE OF SAMPLE PREPARATION IN CHEMBIOANALYSIS: BEATING GIGO (GARBAGE IN - GARBAGE OUT)

P-W-29 Improving insoluble crosslinked proteolytic enzymes for better sample preparation in microscale proteomics applications

Marie-Pier Ouellet, University of Montreal, Canada

PRECLINICAL AND CLINICAL BIOANALYSIS

P-W-30 Developing a lab-on-a-chip platform for detecting Lyme disease via dielectrophoresis

Archana Dahal, University of Idaho, USA

P-W-31 Ratiometric quantitation of a vitamin D derivative on a glass microfiber microfluidic platform

David Bemis, Oregon State University, USA

P-W-32 Development of microfluidic paper-based devices for colorimetric detection of analytes related to periodontal diseases in saliva samples

Soraia Vasconcelos de Freitas, Brazil

P-W-33 An open-channel membrane-based device for malaria diagnostics

Saichon Sumantakul, Oregon State University, USA

MSB 2019 Program – Poster Pitches

Tuesday, 26 March 2019, Cascade Ballroom C

(13:00 - 13:30)

Poster No.	Title and presenter
P-T-03	Optofluidic pipette device for filter-free fluorescence-based biosensing <i>Larry Cheng, Oregon State University, USA</i>
P-T-04	An online fluorescence anisotropy immunoassay for real-time profiling of islet of Langerhans secretions <i>Joel Adablah, Florida State University, USA</i>
P-T-07	Electronically addressable wax-based phase-change valve for fabric-based microfluidic devices <i>Corey Downs, Oregon State University, USA</i>
P-T-13	Investigating polymerase elongation of DNA with fluorescently labeled nucleotides as a sensitive readout for single-cell immunoblotting <i>Aiden Moss, University of California, Berkeley, USA</i>
P-T-15	Experimental and theoretical development of bipolar electrochemistry-fluorescence-based detection system for microchip electrophoresis <i>Manjula Wijesinghe, University of Kansas, USA</i>

Wednesday, 27 March 2019, Cascade Ballroom C

(12:20 - 12:50)

Poster No.	Title and presenter
P-W-22	Online Method for Analyte Focusing at pH Boundary Induced by System Zone in Capillary Zone Electrophoresis <i>Milan Boublik, Charles University, Czech Republic</i>
P-W-23	Development of Nanodisc Affinity Capillary Electrophoresis to Characterize Cytochrome C Interactions with Lipid Bilayers Comprising Cardiolipin <i>Bethany Shelter, University of Montana, USA</i>
P-W-25	A Method to Rapidly Characterize the Dielectrophoresis response of Numerous Single Cells to Determine the distribution of Dielectric Properties in the Population <i>Devin Keck, Clemson University, USA</i>
P-W-32	Development of microfluidic paper-based devices for colorimetric detection of analytes related to periodontal diseases in saliva samples <i>Soraia Vasconcelos de Freitas, Brazil</i>
P-W-33	An open-channel membrane-based device for malaria diagnostics <i>Saichon Sumantakul, Oregon State University, USA</i>

Plenary Speakers Biographies

PLENARY LECTURE 1

Monday, March 25th, 17:15, Cascade Ballroom C

Microdroplet Chemistry

Richard N. Zare, *Stanford University, Professor of Chemistry and Marguerite Blake Wilbur Professor of Natural Science*



Richard N. Zare is the Marguerite Blake Wilbur Professor of Natural Science with an appointment in the Department of Chemistry and (by courtesy) in the Department of Physics, Stanford University. He was born on November 19, 1939 in Cleveland, Ohio, and is a graduate of Harvard University, where he received his B.A. degree in chemistry and physics in 1961 and his Ph.D. in chemical physics in 1964. In 1965, he became an assistant professor at the Massachusetts Institute of Technology, but resigned in three months and moved to the University of Colorado in 1966, remaining there until 1969 while holding joint appointments in the departments of chemistry, and physics and astrophysics. In 1969, he was appointed to a full professorship in the chemistry department at Columbia University, becoming the Higgins Professor of Natural Science in 1975. In 1977, he moved to Stanford University. He was named Chair of the Department of Chemistry at Stanford University in 2005 and served in that position for six years. In 2006, he was named a Howard Hughes Medical Institute (HHMI) Professor. His website: www.stanford.edu/group/Zarelab contains more than you probably want to know about him and the current interests of his research group.

PLENARY LECTURE 2

Tuesday, March 26th, 08:30, Cascade Ballroom C

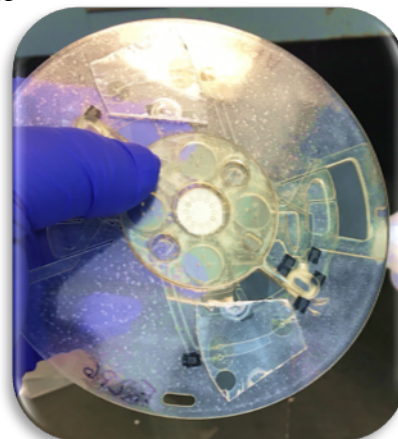
DNA FORENSICS at the Intersection of Bioseparations, Engineering and Molecular Biology

James P. Landers, *University of Virginia, Commonwealth Professor, Depts. of Chemistry, Mechanical Engineering, and Pathology, and the Emily Couric Cancer Center*



James Landers is a Commonwealth Professor of Chemistry and a Jefferson Scholar Faculty Fellow. He is also a Professor of Mechanical Engineering at the University of Virginia and an Associate Professor of Pathology at the University of Virginia Health System. After obtaining degrees in Biochemistry from the University of Guelph in Canada, he did post-doctoral fellowships in *Toxicology* at the Hospital for Sick Children, in *Endocrine Dysfunction* the University of Toronto School of Medicine and, in *Steroid Hormone Cancers* as an *MRC Fellow* at the Mayo Clinic. He founded the Clinical Capillary Electrophoresis Facility in Laboratory Medicine at Mayo Clinic developing clinical assays using microscale separations technology. With efforts from his teams at both the University of Pittsburgh and at the University of Virginia, he pioneered analytical microfluidic systems for next generation molecular analysis in collaboration with MicroLab Diagnostics and Lockheed Martin, and these developments seeded the development of current forensic DNA systems. He has published 260 papers in peer-reviewed journals, 22 book chapters and edited three editions of the *CRC Press Handbook of Capillary Electrophoresis*. Development of one of the first *sample in-answer out* microdevices in 2006¹ led to the 2008 *Association for Lab Automation 'Innovative Technology of the Year' Award*. He is appointed in the School of Science, Engineering and Medicine at UVA, Is a Fellow of Royal Society of Chemistry (UK), the Jefferson Scholars Foundation, and the American Academy Forensic Science, and is the *Microfluidics Editor* for *Analytica Chimica Acta*.

Abstract: Over the last decade, we have explored the development of microfluidic *sample-to-result* systems for genetic analysis. In 2006, we developed a crude glass microchip for the detection of *B. anthracis* in mouse blood and *B. pertussis* in a human nasal mucous, with a sub-30 minute analytical time for sample prep (*DNA extraction/amplification*) and analysis (*electrophoresis-fluorescence detection*)¹. We extrapolated this technology to create a ‘Rapid DNA’ system initially for the military, but with the potential for widespread adoption in the criminal justice sector. This lecture discusses a next generation microfluidics system and how it can be leveraged to generate a fast, portable, cost-effective DNA data pertinent to forensics. This involves finding ways to do microfluidic DNA extraction and PCR amplification, followed by chip-based DNA capillary electrophoresis. This *faSTR DNA Profiling* system leverages centrifugal force to move small volumes of fluid by spinning the microdevice, and exploits a new fabrication approach for cost-effective microfluidic discs². Together, these combine to create a system that is small (<600 in³), light (<10 lbs) and capable of generating a DNA profile in ~30 minutes. We cap off the discussion with the extension of this technology to the civilian sector, specifically, potential use by transplant patients monitoring their immune system adaptation to newly acquired organs.



1) *PNAS* 103(51):19272, 2006. 2) *Nature Protocols* 10(6):875-86, 2015.

PLENARY LECTURE 3 – SCIEX Award Session

Wednesday, March 27th, 08:30 Cascade Ballroom C

Portable Digital Microfluidic Assays: From Bench to Field

Aaron R. Wheeler, University of Toronto, Professor of Chemistry and Canada Research Chair in Microfluidic Bioanalysis

Recipient of the 2019 SCIEX Microscale Separations Innovations Medal and Award



Aaron Wheeler earned his Ph.D. in Chemistry at Stanford University in 2003, working with Richard Zare. After a two-year postdoctoral fellowship at UCLA, he joined the Chemistry Department at the University of Toronto (U of T) with a Tier II Canada Research Chair (CRC). At that time (2005), he was cross-appointed to the Donnelly Centre for Cellular and Biomolecular Research (DCCBR) and the Institute for Biomaterials and Biomedical Engineering (IBBME). He was promoted to Associate and Full Professor in 2010 and 2013, respectively, and in 2018 became the Tier I CRC in Microfluidic Bioanalysis.

In the 13 years since its inception, the Wheeler-lab at the U of T has been internationally recognized for tackling diverse research projects, connected by the theme of using microfluidics to solve problems in chemistry, biology, and medicine. A recent project of note is the group’s efforts to develop a portable system for diagnosing infectious diseases in resource-limited settings. In collaboration with the U.S. Centers for Disease Control and Prevention and the United Nations (UN) Office of the High Commissioner for Refugees, a team of four Wheeler-lab members recently returned from the remote Kakuma Refugee Camp in Northwest Kenya (accessible only by UN charter plane twice per week) in a mission to field-test the group’s infectious disease diagnostics. This work is summarized in this 5-min movie https://youtu.be/Bvs2J1K_WTE and was recently published in the *AAAS* journal, *Science Translational Medicine* (*Sci. Trans. Med.* 2018, 10, eaar6076).

The Wheeler group has become interested in the “open source” approach to instrumentation, which entails inventing a new instrument, loading parts lists, control code, and assembly and operation instructions into the public domain, and granting explicit permission to users to use and modify instrumentation in a format that allows collaborative sharing of improvements. The Wheeler group has built multiple open-source tools; the landing site for these tools registers hundreds of unique hits per week. Likewise, thousands of readers and viewers access the group’s twitter and youtube accounts – see, for example, this whimsical 2-minute video clip (<https://youtu.be/IdYNTL64lfw>) outlining the group’s work developing point-of-care diagnostic devices, or this 1-minute clip about digital microfluidics (<https://youtu.be/NAVrYQqpWMQ>) that was awarded first-prize in the National Science and Engineering Research Council of Canada (NSERC) inaugural Science, Action! competition in 2016.

PLENARY LECTURE 4

Wednesday, March 27th, 17:50, Cascade Ballroom C

Applications of Microchip Electrophoresis to Cell Analysis and in vivo Monitoring

Susan M. Lunte, *University of Kansas, Ralph N. Adams Distinguished Professor of Chemistry and Pharmaceutical Chemistry*

Susan M. Lunte is the Ralph N. Adams Distinguished Professor of Chemistry and Pharmaceutical Chemistry, Director of the Adams Institute for Bioanalytical Chemistry, and Director of the NIH COBRE Center for Molecular Analysis of Disease Pathways at the University of Kansas, Lawrence, KS. She received a B.S. degree in chemistry from Kalamazoo College and a Ph.D. in Analytical Chemistry in 1984 from Purdue University. She has served as the Editor-in-Chief of Analytical Methods and was recently chair of the NIH Instrumentation and Systems Development Study Section. She is a Fellow of the American Association of Pharmaceutical Scientists, American Chemical Society, Royal Society of Chemistry and the American Association for the Advancement of Science. Dr. Lunte received the ANACHEM Award in 2018. Dr. Lunte’s research interests include the development of new methodologies for separation and detection of peptides, amino acids, neurotransmitters and pharmaceuticals in biological fluids. This includes separation-based sensors for the continuous monitoring of drugs and neurotransmitters in freely roaming animals and new methodologies for the determination of reactive oxygen and nitrogen species in cells.



PLENARY LECTURE 5

Thursday, March 28th, 08:30, Cascade Ballroom C

Capillary Electrophoresis Improves Metagenomic Analysis of an Environmental Microbiome

Norman J. Dovichi, *University of Notre Dame, Grace-Rupley Professor of Chemistry and Biochemistry*

Norm Dovichi is the Grace-Rupley Professor of Chemistry and Biochemistry at the University of Notre Dame. His research has spanned a wide range of topics. In the 1980s, he introduced the concept of single molecule detection to the chemical literature. In the 1990s, his group developed capillary array electrophoresis instruments for high-throughput DNA sequencing. He was recognized for this work by the journal Science as an “Unsung Hero of the Human Genome Project”. In the 2000s, he focused his efforts on the analysis of the content of single eukaryotic cells. Over the last decade, his group has focused its attention



on coupling capillary electrophoresis with tandem mass spectrometry as a tool for high throughput and high sensitivity proteomics. Recent results include detection of >27,000 peptides in an 120-min single-shot separation. His group used HPLC-MS/MS for the first proteomic analysis of vertebrate development. Over 5,500 proteins were quantified at six stages of early development of *Xenopus laevis*. This work has been extended to the characterization of protein expression in single blastomeres isolated from embryos at the 2, 4, 8, 16, 32, and 50-cell stage. These are the first comprehensive studies of protein expression in single vertebrate cells. Finally, he has employed capillary electrophoresis coupled with next-generation DNA sequencing for the comprehensive metagenomic analysis of a complex environmental microbiome.

Keynote Speakers Biographies

KEYNOTE LECTURE 1

Tuesday, March 26th, 09:20, Cascade Ballroom A

Frontal continuous capillary electrophoresis to study complex (macro)molecular interactions

Hervé Cottet, Professor in Analytical Chemistry, Institut des Biomolécules Max Mousseron, University of Montpellier, France



SESSION: DEVELOPMENTS AND APPLICATIONS IN ELECTROKINETIC SEPARATIONS

Hervé Cottet (44) completed his PhD in analytical chemistry in 1999 at the Ecole Nationale Supérieure de Chimie de Paris (ENSCP, ParisTech, France) on Capillary Electrophoresis (CE) of synthetic polyelectrolytes. After a post-doc at the Technical University of Eindhoven (the Netherlands), he joined the University of Montpellier in 2000 as an assistant professor. In 2007, he obtained a full professor position at the Biomolecules Institute (IBMM) in Montpellier. Since 2012, he is the head of a Research Department (15 permanent researchers) at the IBMM. His research work concentrates at the interface between separation sciences, physical chemistry, polymers and biology/pharmaceutical sciences. He is developing CE methodologies (free solution and gel-based separations, micellar / microemulsion modes, isotachopheresis, isoelectric focusing, preconcentration strategies, 2D-separations) and Taylor Dispersion Analysis (TDA) for the characterization of (bio)polymers, polyelectrolytes, drug delivery systems, dendrimers, nanoparticles, colloids and bacteria. He is both interested in fundamentals (mobility modeling, electrophoretic behavior) and practical (or industrial) applications of CE and TDA. In 2006, he awarded the price from the Analytical Chemistry Division of the French Chemical Society. In 2011, he has been nominated as a junior member of the Institut Universitaire de France. He has co-authored more than 120 scientific articles dealing with CE and/or TDA. <http://www.researcherid.com/rid/C-9010-2013> <http://www.pages-perso-herve-cottet.univ-montp2.fr/>

KEYNOTE LECTURE 2

Tuesday, March 26th, 09:20, Cascade Ballroom B

Chromatography in clinical diagnostics; selectivity at scale, specifically

Russ Grant, Vice President of Research and Development, LabCorp, Burlington, NC, USA

SESSION: PRECLINICAL AND CLINICAL BIOANALYSIS

Dr Grant earned a PhD in chromatographic and mass spectrometric technologies from the University of Swansea, Wales, United Kingdom. He continued his scientific training in various industrial settings, which have included senior

scientist at GSK, principal scientist at Cohesive Technologies, technical director at Eli Lilly, and director of mass spectrometry at Esoterix Endocrinology. Dr Grant has pioneered the use of direct injection technologies, chromatographic systems multiplexing, utility of automation, and new analytical platforms for application in bioanalytical applications. His research goals are focused upon improvements in speed, sensitivity, and quality of liquid chromatography with tandem mass spectrometric (LC-MS/MS) analytical systems and assays.

KEYNOTE LECTURE 3

Tuesday, March 26th, 14:40, Cascade Ballroom A

Modulation approaches for 2 dimensional chromatography

Emily Hilder, *Director: Future Industries Institute, University of South Australia, Australia*



SESSION: MULTIDIMENSIONAL SEPARATIONS

Professor Emily Hilder is the Director of the University of South Australia's Future Industries Institute (FII). Emily is an analytical chemist and her research focuses on the design and application of new polymeric materials that can be used to improve analytical measurements including the application of these new technologies for separations, bio-analysis and disease diagnosis. She is a Fellow of the Australian Academy of Technology and Engineering and the Royal Australian Chemical Institute and has been recognized by a number of awards including the Jubilee Medal (ChromSoc, UK), LCGC (North America) Emerging Leader in Chromatography and has been included in the Analytical Scientist Power Lists from 2013-2017. She is an Associate Editor of Analytical Chemistry (ACS).

Emily was born and raised in Tasmania and is a graduate of the University of Tasmania where she completed her PhD in analytical chemistry in 2000. Following postdoctoral positions at Johannes Kepler University (Austria) and the E.O. Lawrence Berkeley National Laboratory (USA) she returned to Australia and the University of Tasmania in 2004 as part of the Australian Centre for Research on Separation Science (ACROSS) where she held an ARC APD Fellowship from 2004-2007 and ARC Future Fellowship from 2010-2014. She was Director of the ARC Training Centre for Portable Analytical Separation Technologies (ASTech) and Head of Chemistry from 2014-2015 before relocating to the University of South Australia in 2016.

KEYNOTE LECTURE 4

Tuesday, March 26th, 14:40, Cascade Ballroom B

Active digital microfluidic paper chips for the Point-of Care biomedical application

Kwanwoo Shin, *Professor of Chemistry and Director of Institute of Biological Interfaces, Sogang University, Seoul, Korea*



SESSION: ELECTROCHEMICAL MICROANALYTICAL DEVICES

Kwanwoo Shin is Professor of Chemistry Department at Sogang University since 2006. He received his Ph.D. in Materials Science and Engineering at Stony Brook University. After a post-doc at NIST and joined as a faculty at GIST in 2002 and moved to Sogang University. His research interests mainly lie in the interdisciplinary areas, termed as "artificial cells", using lipid membranes and reconstitution of membrane proteins. In 2015, he founded a company, "lab311", developing inkjet based paper chips and analytical tools.

KEYNOTE LECTURE 5

Tuesday, March 26th, 16:40, Cascade Ballroom A

Sample pretreatment: A prerequisite for effectively detecting lipoarabinomannan in urine and serum from active TB patients

Delphi Chatterjee, Professor, Department of Microbiology, Immunology and Pathology, Colorado State University, USA



SESSION: ROLE OF SAMPLE PREPARATION IN CHEMBIOANALYSIS: BEATING GIGO (GARBAGE IN - GARBAGE OUT)

Delphi Chatterjee is a Professor of Microbiology, Immunology & Pathology at Colorado State University. Her research group has a long standing focus on the glycomics, glycobiology, genetics, and pathogenesis of Lipoarabinomannan, a major cell envelope antigen of *Mycobacterium tuberculosis*, which is the causative agent of tuberculosis. This work, supported for a number of years by the WHO and NIH, has been key in shaping the present day understanding of role of the LAM in TB pathogenesis. Work in her laboratory is also aimed at the development of new antibodies in work to create a field deployable test for TB in patient specimens. She has 130 research publications and has served as a member of special or ad hoc NIH study sections, all focused on Tuberculosis, Leprosy, and related bacterial diseases.

KEYNOTE LECTURE 6

Tuesday, March 26th, 16:40, Cascade Ballroom B

Paper-based electroanalytical platforms for bioanalytical and environmental monitoring

Frédérique Deiss, Assistant Professor of Analytical Chemistry, Department of Chemistry and Chemical Biology, Indiana University – Purdue University (IUPUI), Indianapolis, USA



SESSION: MICROSCALE SYSTEMS FOR HUMAN AND ENVIRONMENTAL HEALTH MEASUREMENTS

Frédérique Deiss was born in North-East of France and moved to Bordeaux (South-West of France) for her Engineering degree in Chemistry and Physics from the National Engineering school of Chemistry and Physics of Bordeaux, in 2006. She received her PhD in Chemistry-Physics in 2009, from the University of Bordeaux, working on opto-electrochemical biosensors using optical fibers with Professor Neso Sojic. During her PhD, she was also a visiting scholar at Tufts University, Boston and in the Italian Universities of Venice and Padova. Frédérique held postdoctoral positions at Harvard University with G. Whitesides and then at the University of Alberta, Edmonton, Canada with R. Derda, until joining IUPUI in Indianapolis, IN, USA. She is an assistant professor in the department of Chemistry & Chemical Biology at IUPUI since August 2015. Her group develops electroanalytical platforms (i.e., assays, techniques, devices) for bioanalysis, preventive care and forensics using paper, microfluidics and spectroscopy.

KEYNOTE LECTURE 7

Wednesday, March 27th, 09:20, Cascade Ballroom A

Raman Hyperspectroscopy for forensic purposes and medical diagnostics

Igor Lednev, Professor of Chemistry, University at Albany – SUNY, USA

SESSION: NOVEL DETECTION METHODS FOR MICROSEPARATIONS

Bio pending.



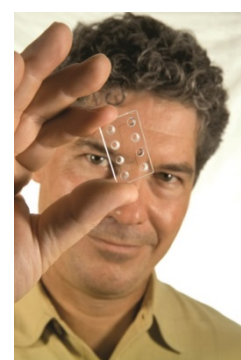
KEYNOTE LECTURE 8

Wednesday, March 27th, 09:20, Cascade Ballroom B

Microchip CE-ESI-MS: characterization of molecular boulders

Michael Ramsey, Goldby Distinguished Professor of Chemistry, University of North Carolina at Chapel Hill, USA

SESSION: MICROSCALE SEPARATIONS IN ANALYSIS OF INTACT PROTEINS AND PROTEIN COMPLEXES



Dr. J. Michael Ramsey holds the Minnie N. Goldby Distinguished Professor of Chemistry Chair at the University of North Carolina - Chapel Hill. In addition, he is a member of the faculty in the Departments of Biomedical Engineering and Applied Physical Sciences, and the Carolina Center for Genome Sciences. He is a member of the National Academy of Engineering and a Fellow of the Optical Society of America, the American Chemical Society, and the American Institute for Medical and Biological Engineering. Moreover, Dr. Ramsey is the scientific founder of Caliper Technologies (NASDAQ:CALP), renamed Caliper Life Sciences and acquired by PerkinElmer in 2011. He is also the scientific founder of the venture-backed companies 908 Devices Inc., a company developing revolutionary compact mass spectrometry and chemical separations-based products, and Genturi Inc., a genomics tools provider. Prof. Ramsey has published over 300 peer-reviewed papers (H-index = 64) and presented over 500 invited, plenary, or named lectures. In addition, he has over 110 issued and 20 pending patents.

KEYNOTE LECTURE 9

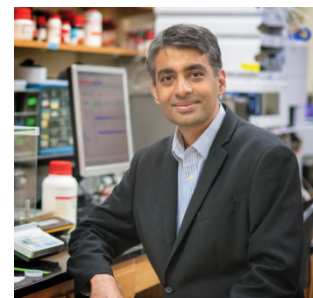
Wednesday, March 27th, 14:00, Cascade Ballroom A

Chiral separations at the speed of sensors and the concept of peak processing

M. Farooq Wahab, Research Engineering Scientist-V, Department of Chemistry & Biochemistry, University of Texas at Arlington, Arlington, Texas, USA

SESSION: ANALYSIS OF PHARMACEUTICALS & CHIRAL COMPOUNDS

M. Farooq Wahab is currently a Research Engineering Scientist-V at the University of Texas at Arlington. He received a postdoctoral fellowship with Professor Armstrong after completing his PhD at the University of Alberta. His research



interests include fundamentals of separation science, ultrahigh-efficiency phases, hydrophilic interaction chromatography, supercritical fluid chromatography, and data processing. Wahab was recently selected among “Top 40 Under 40” analytical chemists by the Analytical Scientist and received a “Young Investigator Award” by the Chinese American Chromatography Association (Pittcon 2019).

KEYNOTE LECTURE 10

Wednesday, March 27th, 15:50, Cascade Ballroom A **Tunable guanosine biogels for molecular solubilization and manipulation**

Linda B McGown, *Professor of Chemistry, Rensselaer Polytechnic Institute, Troy, New York, USA*

SESSION: INNOVATIONS IN MICROSEPARATIONS: UNIQUE MECHANISMS OF TRANSPORT

Linda McGown received her B.S. from the University of Buffalo in 1975 and her Ph.D. from the University of Washington in 1979. She served on the faculties of Cal State Univ Long Beach, Oklahoma State University and Duke University before joining RPI in 2004. Her current research focuses on DNA separation, aptamers, molecular self-assembly and astrobiology.



KEYNOTE LECTURE 11

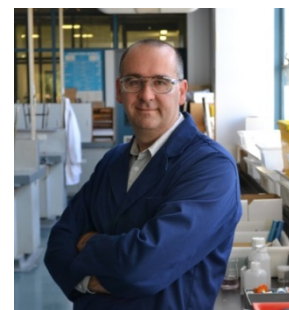
Wednesday, March 27th, 14:00, Cascade Ballroom B

Rapid screening of inorganic explosives

Michael Breadmore, *Australian Centre for Research on Separation Science; Chemistry, School of Natural Science, University of Tasmania, Australia*

SESSION: APPLICATIONS IN FORENSIC SCIENCES AND FOOD-BEVERAGE-NUTRITION ANALYSES

Professor Michael Breadmore is a professor in Chemistry at the University Tasmania. He obtained his PhD from UTAS in 2001, returning in 2004, with the next 15 years funded by the Australian Research Council as a Research Fellow. He has made a continued and sustained contribution towards miniaturised analytical technology and platforms for clinical, forensic, environmental and food applications.



KEYNOTE LECTURE 12

Wednesday, March 27th, 15:50, Cascade Ballroom B

Capillary HILIC-MS for selective and sensitive protein analysis

Govert W. Somsen, *Professor of Biomolecular Analysis/Analytical Chemistry, Vrije Universiteit Amsterdam, The Netherlands*

SESSION: BIOPHARMACEUTICAL AND BIOMOLECULE ANALYSIS

Govert Somsen is full professor of Biomolecular Analysis/Analytical Chemistry at the Vrije Universiteit Amsterdam, The Netherlands. He obtained his doctorate in Amsterdam, and subsequently was assistant and associate professor at



the University of Groningen and at Utrecht University in The Netherlands. His current research interests include the compositional and conformational characterization of intact biomacromolecules, and the bioactivity screening of compounds in complex samples. His group built an internationally recognized expertise in the hyphenation of separation techniques with mass spectrometry and optical spectroscopy for the analysis of intact proteins. Somsen is (co)author of over 180 peer-reviewed papers and has an H-index of 39. He is editor of *Journal of Chromatography B*.

KEYNOTE LECTURE 13

Thursday, March 28th, 09:20, Cascade Ballroom A

Development of porous materials-based microfluidic devices

Elain Fu, *Assistant Professor of Bioengineering, Oregon State University, Corvallis, USA*



SESSION: MICROFLUIDIC SYSTEMS INNOVATIONS

Elain Fu is an Assistant Professor of Bioengineering at Oregon State University. Prior to this, she spent three years as an Assistant Research Professor of Bioengineering at the University of Washington. Elain received a Sc.B. degree in Physics from Brown University, and M.S. and Ph.D. degrees in Physics from the University of Maryland, College Park. Her research focus has been microfluidics-based sensor development with the goal of using an understanding of the physics and chemistry of device operation to improve device performance for field applications. Most recently, she has been active in the area of paper microfluidics. In particular, her lab develops tools for the manipulation of reagents in porous materials, in the context of high-performance biomarker detection for global health applications. She has published 50 articles in peer-reviewed journals and is a co-inventor on multiple patents and patent applications.

KEYNOTE LECTURE 14

Thursday, March 28th, 12:40, Cascade Ballroom A

Label-free sorting of neural stem cells using dielectrophoresis

Lisa A. Flanagan, *Associate Professor of Neurology, Biomedical Engineering, Anatomy and Neurobiology, University of California Irvine, Irvine, California, USA*



SESSION: DIELECTROPHORESIS AND CELL SORTING

Dr. Flanagan's research program combines neural cell biology and bioengineering to develop non-invasive methods to identify the fate potential of stem cells and optimize transplantation scaffolds for neural stem cells. Their goal is to improve the use of these cells to repair the brain and spinal cord. Before joining the University of California Irvine, Dr. Flanagan completed her Ph.D. at University of California, San Diego and post-doctoral training at Harvard Medical School in Boston, Massachusetts. She is a recipient of the National Science Foundation CAREER Award.

KEYNOTE LECTURE 15

Thursday, March 28th, 14:30, Cascade Ballroom A

Point-of-care testing for individualized HIV management

Barry Lutz, Associate Professor, Pilcher Faculty Fellow, Department of Bioengineering, University of Washington, Seattle, USA

SESSION: BIOANALYTICAL DEVICES FOR PRECISION HEALTH APPLICATIONS



Dr. Lutz received his B.S. in Chemical Engineering from the University of Texas, Austin, and his Ph.D. in Chemical Engineering from the University of Washington. He has held postdoctoral positions at the Microscale Life Sciences Center at the University of Washington and at Intel Corporation. Dr. Lutz joined the faculty of the Department of Bioengineering at the University of Washington in 2009, and was promoted to Associate Professor in 2015. The Lutz Lab pursues economically sustainable medical device technologies appropriate for use in low-income global markets. In their research, the Lutz Lab uses an enhanced understanding of the physical processes of flow, transport and reaction, to devise improved, or entirely new, devices for detecting and treating disease. Dr. Lutz also leads commercialization-driven projects to develop implantable microfluidic devices. Dr. Lutz has published over 40 articles in peer-reviewed journals and is an inventor on multiple patents.

KEYNOTE LECTURE 16

Thursday, March 28th, 09:20, Cascade Ballroom B

3D printed microfluidic devices for preterm birth biomarker analysis

Adam T. Woolley, University Professor in the Department of Chemistry and Biochemistry, Brigham Young University, USA

SESSION: ADVANCES IN INSTRUMENTATION, DESIGN, AND APPLICATIONS OF BIOSENSORS



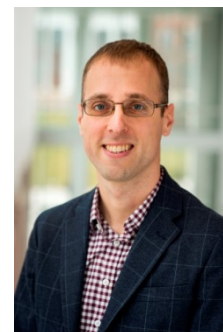
Adam T. Woolley is currently University Professor in the Department of Chemistry and Biochemistry at Brigham Young University (BYU). He graduated summa cum laude with a B.S. in Chemistry from BYU and received his Ph.D. in Chemistry from the University of California–Berkeley under the direction of Professor Richard Mathies. His doctoral research involved the development of micromachined electrophoretic systems for rapid DNA analysis, and his work was recognized with the Fannie and John Hertz Foundation Thesis Prize. Woolley was a Cancer Research Fund Runyon-Winchell Foundation Postdoctoral Fellow in the group of Professor Charles Lieber at Harvard University. His postdoctoral work focused on implementing carbon nanotube probes for high-resolution biological scanning probe microscopy. Woolley is the recipient of several recognitions, including a 2007 PECASE award from NIH, and the 2015 AES mid-career award. Additionally, he has served as Chair Editor for Analytical and Bioanalytical Chemistry since 2017. Woolley's current research entails: combining affinity purification and solid-phase enrichment with electrophoretic separation in 3D printed microfluidic devices to enable biomarker quantitation; developing nucleic acid diagnostic systems for determining antibiotic resistance profiles in sepsis; and devising ways to fold DNA into controlled nanoscale designs that result in functional electronic nanomaterials through selective metallization.

KEYNOTE LECTURE 17

Thursday, March 28th, 12:40, Cascade Ballroom B

Proteomics and metabolomics of single embryonic cells by microanalytical CE-MS

Peter Nemes, Professor, Department of Chemistry and Biochemistry, University of Maryland, College Park, USA



SESSION: ADVANCED –OMICS APPROACHES: EXTRACTING MORE INFORMATION USING LESS (SAMPLE, TIME,...)

Research in the Nemes group develops ultrasensitive microanalytical technologies to enable the detection, identification, and quantification of proteins and metabolites in the building block of life: the cell. The group uses these technologies to study how cells execute different molecular programs as they differentiate to form specific tissues during early embryonic development (single blastomeres) and assume different functions in the nervous system (single neurons in the mouse).

KEYNOTE LECTURE 18

Thursday, March 28th, 14:30, Cascade Ballroom B

Top down analysis of protein structural variation and structural dynamics with capillary electrophoresis directly coupled to high resolution mass spectrometry

David DY Chen, Professor of Chemistry, Associate Member of the Department of Anesthesiology, Pharmacology & Therapeutics in the Faculty of Medicine, University of British Columbia, Canada



Distinguished Guest Professor at the Jiangsu Collaborative Innovation Center of Biomedical Functional Materials, Nanjing Normal University

SESSION: CE-MS: ADVANCES AND APPLICATIONS

Prof. David Da Yong Chen received his Ph.D. in Chemistry in 1993 from the University of Alberta, where he also received postdoctoral training in Chemistry at the Department of Medical Microbiology and Infectious Diseases. In July 1994, he joined the faculty of the Chemistry Department at the University of British Columbia, where he is currently a Full Professor in the Faculty of Science, as well as an Associate Member of the Department of Anesthesiology, Pharmacology & Therapeutics in the Faculty of Medicine. In December 2013, he was appointed Distinguished Guest Professor at the Jiangsu Collaborative Innovation Center of Biomedical Functional Materials, Nanjing Normal University. Dr. Chen's research interests include investigation of principles of fluid migration and chemical separation, development of novel separation methods and purification systems, and coupling micro separation systems to mass spectrometry. Dr. Chen was given the 2002 Royal Society of Chemistry (RSC) Award in Analytical Separation Methods, and the 2003 Charles McDowell Award for Excellence in Research, a gold medal given to the most outstanding young scientist at UBC. For his contribution in analytical chemistry, Dr. Chen received the W. A. E. McBryde Medal and the Maxxam Award from the Canadian Society for Chemistry in 2008 and 2015, respectively.

Abstract of talk: While LC-MS is indisputably one of the most important analytical techniques today, CE-MS, on the other hand, has only been successfully used by a relative small number of scientists. With the improvement in the interface technology between CE and MS in recent years, the sensitivity and robustness of CE-MS have been significantly improved, and CE-MS technology is poised to become an increasingly more important tool to be used to push the frontiers of biomedical and pharmaceutical research. The application of CE-MS, including capillary

isoelectric focusing directly coupled to mass spectrometry (cIEF-MS) for the analysis of antibody drug complexes, monoclonal antibodies, will be discussed. The use of CE-MS to monitor hydrogen-deuterium exchange and disulfide bond re-arrangement for the study of protein structural dynamics will also be demonstrated.

Short Courses – Descriptions and Instructor Biographies

MSB 2019 offers four stimulating and highly informative short courses for symposium participants. The short courses are lectured by recognized experts in the field and run in parallel on Monday, March 25th.

The following four short courses (2 hr each) will be offered in two sessions on Monday, March 25th, 10:00 – 12:00 (AM) and 13:30 – 15:30 (PM) at \$65 per course or two for \$100. Please Register before March 18, 2019.



SC1 - Simul and PeakMaster: Applying Freeware Tools for Predicting and Understanding Electromigration Separations and Method Development

Monday, March 25th, Linus Pauling Science Center, Room LPSC 176

***Prof. Bohuslav Gaš**, Professor of Physical Chemistry, Charles University in Prague, Czech Republic*

<http://web.natur.cuni.cz/gas/index.html>

Course description: Electrophoresis, unlike chromatography, allows a more precise look into the mechanism of separation because its environment is much simpler than in chromatography: instead of the heterogeneous two phases in chromatographic systems, electrophoresis works in a homogeneous liquid solution of electrolytes. We have managed to implement the mathematical model of electromigration into two user friendly software tools, which describe the real behaviour quite well and greatly facilitate method development of electrophoretic separations.

The dynamical simulation software Simul solves nonlinear continuity equations numerically, which enables visualizing the distribution of any constituent of the particular separation system in the separation channel at any time. This way it gives a complete picture of the particular separation run. It allows inspection of stacking or sweeping phenomena, sharpening of zone edges, focusing of ampholytes in isoelectric focusing systems, etc.

The PeakMaster series of software is based on the linear theory of eigenmobilities. This concept allows prediction of some theoretical characteristics of the separated analytes, which are connected with the experimentally important quantities in the separation system. They are, e.g., pH, number, positions and shapes of system peaks, extent of electromigration dispersion, simulation of the electropherogram, separation in chiral environment.

This way the experimental trial-and-error approach in method development is replaced by the efficient and reliable computer simulation.

Bohuslav Gaš, who was born in the Czech Republic, is a Full Professor of Physical Chemistry at the Faculty of Science, Charles University, Prague. His research interests include theory of electromigration separation processes, and advanced instrumental issues. He has had long term collaboration with Agilent Technologies GmbH in Waldbronn, Germany. He is currently Deputy Editor of *Electrophoresis*, a Wiley VCH journal, and Editor of Special Issues of Electrophoresis on Fundamentals. In 2016 he was awarded the Arnold O. Beckman medal (now named the SCIEX Award) for exceptional lifelong contributions to the theoretical understanding and development of new electro-driven separation techniques.



SC2 - Advanced CE-MS Approaches for Metabolomics

Monday, March 25th, Linus Pauling Science Center, Room LPSC 178

Prof. Rawi Ramautar, *Assistant Professor of Analytical Chemistry, Leiden University, The Netherlands*

<https://www.universiteitleiden.nl/en/staffmembers/rawi-ramautar#tab-1>

Course description: In the field of metabolomics, capillary electrophoresis-mass spectrometry (CE-MS) has become a very useful analytical technique for the profiling of highly polar and charged metabolites in biological samples. In this course, a comprehensive overview of recent developments in CE-MS for metabolic profiling studies is provided. Topics that will be covered include CE separation modes, capillary coatings and recent interfacing designs for hyphenating CE to MS. In this context, special attention will be devoted to interfacing techniques allowing in-depth metabolic profiling studies by CE-MS. Throughout the discussion attention will be paid to practical aspects used for CE-MS-based metabolomics. The potential of this analytical technique for large-scale and quantitative clinical metabolomics studies is also addressed. Finally, the utility of CE-MS for metabolomics is demonstrated for selected clinical and biological problems, especially for volume-limited samples. Conclusions and perspectives on this unique analytical strategy are presented.

Rawi Ramautar obtained in 2010 his PhD on the development of CE-MS methods for metabolomics from Utrecht University, the Netherlands. In 2013 and 2017, he received the prestigious Veni and Vidi research grants from the Netherlands Organization for Scientific Research for the design of CE-MS approaches for volume-restricted metabolomics. Currently, he is a principal investigator at the Leiden University where his group is developing microscale analytical workflows for sample-restricted biomedical problems. Rawi was recently selected for the Top 40 under 40 Power List of the Analytical Scientist.



SC3 - An Introduction to Electron Microscopy

Monday, March 25th

Linus Pauling Science Center, Room LPSC 145

Dr. Peter Eschbach, *Director, OSU Electron Microscopy Facility, Oregon State University, USA*

<https://emfacility.science.oregonstate.edu/node/Staff>

Course description: Participants will learn about the scanning electron microscopy (SEM) and transmission electron microscopy (TEM) in the context of surface science and microfluidics. Emerging separations technologies utilize novel surface chemistries and unique micro- and nanostructures to achieve ambitious analytical goals. SEM and TEM are valuable tools for quantitatively assessing the features and chemistries of separations media and devices. This course will introduce participants to both SEM and TEM.



SC4 - Paper-Based Analytical Devices

Monday, March 25th

Linus Pauling Science Center, Room LPSC 160

Prof. Charles Henry, Professor of Analytical Chemistry, Colorado State University, USA

<https://wp.natsci.colostate.edu/henrylab/>

Course description: Paper has long been used as a substrate for chemical measurements, starting from simple litmus paper and advancing to more elegant methods like lateral flow immunoassays. In 2007, Whitesides' group reported a new use of paper as a substrate for chemical analysis where flow channels were created in paper by adding hydrophobic barriers. In this way, multiplexed chemistry could be carried out in a simple, elegant format. Since this initial work, the field of paper-based analytical devices (also referred to as Lab-on-Paper or Capillarity-Based Microfluidics) has grown exponentially. Growth in this field is the result of the ease of manufacturing and use of the devices. This short course will cover a range of topics within the field, including fundamental device characteristics, fabrication, and applications. A short laboratory demonstration will also be included that provides limited hands on experience with making and using paper-based analytical devices.

Charles S. Henry received his PhD from the University of Arkansas followed by postdoctoral studies at the University of Kansas. He started his academic career at Mississippi State University before moving to Colorado State University in 2002, where he is currently Professor of Chemistry. His research interests lie broadly in the areas of microfluidics and electrochemistry with application to questions in bioanalytical and environmental chemistry.

