April 2012
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AES Newsletter

We are pleased to announce: Pittsburgh, PA, city of bridges, home to 1600 technology companies, named by Forbes as the most livable US city in 2010, *is the site of the next annual meeting of the Electrophoresis Society,* Oct 28 - Nov 2, 2012. Don't miss this one!

The American Electrophoresis Society (AES), in association with the American Institute of Chemical Engineers (AIChE), is proud to be part of the 2012 Annual Meeting in Pittsburgh, PA to provide a forum for the latest progress in electrophoretic technology. We are excited to announce the addition of several new sessions this year. Also, for the first time AES will co-host two microfluidics and microscale flow sessions with the AIChE Area 1J. We are pleased to present descriptions of the planned 13 sessions of the meeting on the following pages. We'd like to highlight the diversity of sessions, including new sessions such as Electric Fields at Interfaces, Electrokinetic Behavior of Micro- and Nano-Particles, and Electrokinetics in Non-Polar Media.

Additionally, we will have an Award session, a Plenary session, a Poster session, and an opportunity for students to rub shoulders with leaders in the field at "Lunch with Leaders." Late breaking submissions for the Poster session will be accepted until **October 7th** and are encouraged for any aspect of electrophoresis. This year's Poster session will include awards for the best student posters, based on judging by 3 members of the AES council, of $100 for First Place and $50 for Second Place for student members of the Society. The Poster Reception is scheduled for Tuesday, Oct 30, while the AES Banquet will take place on Wednesday, Oct 31 at a local restaurant. We look forward to seeing you there. **Call for Papers closes on May 2nd 2012.**

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AES 2012 Meeting Co-Chairs

Inside this issue:

Many thanks to our supporters and friends for their generous contributions.

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Our traditionally strong meetings would simply not be possible without help from our supporters. Their donations are greatly appreciated.

Send news for the web page **www.aesociety.com** to Webmaster Adrienne Minerick **minerick@mtu.edu** or Associate Webmaster Rafael Davalos **davalos@vt.edu**

Send news for the newsletter to Editor Nancy Kendrick **nancy@kendricklabs.com** or Assoc. Editor Victor Ugaz **ugaz@tamu.edu**

Contact Matt Hoelter, AES Executive Director, with questions about the Society **matt-aes@tds.net**

AES MEETING PROGRAM - 2012

T3000 Plenary Session of the American Electrophoresis Society

Invited lectures from leading researchers in the area of electrokinetics. These researchers are being asked to focus on a particular area of their interest and explain how their research in the area of electrokinetics has provided key insights and/or enabled key applications.

Chair: Aditya S. Khair
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Email: akhair@andrew.cmu.edu

Co-Chair: Yolanda Fintschenko
LabSmith
Director, Business Development
Email: yfintschenko@labsmith.com

T3001 Detection: Surface Techniques and Spectroscopy

This session welcomes experimental, theoretical, and computational papers concerning surface-based detection techniques and spectroscopy.

Chair: Shramik Sengupta
Department of Biological Engineering
University of Missouri
Email: senguptas@missouri.edu

T3002 Advances in Electrokinetics & Electrophoresis: Bioanalytical, Biosensing & Biomedical

Remarkable progress has been made in the fabrication micro- and nano-scale devices for the manipulation and detection of organisms and biomolecules. This session will focus on integration and detection aspects related to the emerging concept of a 'chip-in-a-lab' as well as the more established 'lab-on-a-chip' systems. Topics of interest include, but are not limited to, platforms for multi- and uni-cellular analysis (biochemical or physical), immunosensors, electrochemical sensors, and various spectroscopic and separation tools in a microchip format. We are particularly interested in papers dealing with micro/nano scale systems and issues related to molecular (biochemistry), cellular, or systems biology. Both experimental and theoretical contributions are welcome.

Chair: Edgar D. Goluch
Department of Chemical Engineering
Northeastern University
Email: e.goluch@neu.edu

Co-chair: Alexandra Ros
Dept. of Chemistry and Biochemistry
Arizona State University
Email: alexandra.ros@asu.edu

T3003 Electrokinetics in Non-Polar Media

This session welcomes experimental, computational, and theoretical papers on electro-kinetic and electro-static phenomena in non-polar media. Topics of interest include, but are not limited to the origin, formation, and stabilization of charge carries; double layer charging and transient currents; and electrophoresis in non-polar fluids.

Chair: Paul Sides
Department of Chemical Engineering
Carnegie Mellon University
Email: ps7r@andrew.cmu.edu

Co-chair: Ben Freireich
The Dow Chemical Company
Arizona State University
Email: BJFreireich@dow.com

T3004 Electric Fields At Interfaces: Electro-Wetting, Droplets, and Vesicles

This session welcomes theoretical, computational, and experimental papers concerning the broad area of electric fields at interfaces. Contributions relating to electro-wetting and droplet and vesicle dynamics in electric fields are of particular interest.

Chair: Petia M. Vlahovska
School of Engineering
Brown University
Email: petia_vlahovska@brown.edu

Co-chair: Margarita Staykova
Department of Mechanical and
Aerospace Engineering
Princeton University
Email: staykova@princeton.edu

T3005 Advances in Electrophoresis for Protein Separation and Analysis

Studies of protein expression patterns play a vital role in understanding the complex responses of cells, tissues, and organisms to stimuli or mutations. While recent developments have allowed these patterns to be investigated at an unprecedented level of detail, further advances are needed in order to fully illuminate the interplay among the many factors governing cellular response. Specifically, new technologies are needed that provide quantitative information with high sensitivity and throughput. This session will focus on the development of such proteomic technologies and their applications. Of particular interest are papers describing advances in electrophoretic protein separations, novel means of detecting and quantifying proteins, methods of analyzing specific protein classes, mass spectroscopic methods, and other related technologies. Papers are also sought that present research on the proteomic analysis of post-translational modifications.

Chair: Tom Berkelman
Bio-Rad Laboratories
Thomas_Berkelman@bio-rad.com

Co-Chair: Phil Beckett
Proteomics Applications
GE Healthcare Bio-Sciences
Email: phil.beckett@ge.com

T3006 Advances in Electrokinetics and Electrophoresis: Fundamentals

Electrokinetics involves the use of electrical fields and forces between surfaces and particles to produce a motion of colloidal particles within a medium. The latter could be either fluid, porous or fibrous. Notable applications are environmental, such as the decontamination of water or soil, the cleaning of water for drinking purposes, and the decontamination of industrial effluents. Electrostatics aspects in membrane-based separation processes is another excellent example, as is micro-filtration in electrically enhanced processes. For this session, detailed analysis of particle-to-particle electrostatics forces, including experimental measurements of magnitude and computer-based simulation approaches, are relevant, as is technology involving electrokinetics principles. Contributions with novel approaches related to fundamental principles, modeling, and experimental studies will be welcomed. We would like to have a balance between a given problem, the motivation, and the outcome related to the solution.

Chair: Blanca H. Lapizco-Encinas
Department of Chemical Engineering
Tennessee Technological University
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Co-chair: Mark Hayes
Dept. of Chemistry and Biochemistry
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T3007 DNA Analysis in Microfluidic and Nanofluidic Devices

This session of contributed presentations will focus on the use and modeling of DNA electrophoresis in microfabricated and nanofabricated devices. Topics of interest include design and fabrication, simulation, and theoretical modeling of the transport phenomena in existing technologies, and applications.

Chair: Lisa A. Holland
Department of Chemistry
West Virginia University
Email: Lisa.Holland@mail.wvu.edu

Co-chair: Rodrigo Martinez-Duarte
Ecole Polytechnique Fédérale
de Lausanne
Email: drmartnz@gmail.com

T3008 Nanoscale Electrokinetics

The objective of this session is to bring together researchers from academia, national research laboratories and industry, to exchange ideas to advance research in fundamentals and applications in nanoscale electrokinetics. The fundamentals cover transport phenomena, electrokinetics and electrohydrodynamics, and effect of surface modification on electrokinetics in nanoslots, nanochannels and nanoporous materials. Applications include, but are not limit to, nanofluidic devices for sample separation, preconcentration, DNA sequencing, sensor, nanofluidics based electronic devices (concentration polarization; current rectification, over-limiting current and second-kind electro-osmosis, desalination and energy conversion via streaming currents etc.). All experimental, theoretical, and computational works relevant to nanoscale electrokinetics are welcome.

Chair: Guiren Wang
Department of Mechanical Engineering
University of South Carolina
Email: wanggu@cec.sc.edu

Co-chair: Chien-Pin Chen
Department of Chemical and Materials Engineering
University of Alabama in Huntsville
Email: chenc@uah.edu

T3009 Electrokinetic Behavior of Micro- and Nano-Particles: Directed Assembly Under Electric Fields

The directed assembly and control of micro- and nano-particles benefits a diverse set of engineering applications. An externally applied electric field is typically used to manipulate colloids, but a host of electrokinetic phenomena may be at play during these processes. Direct and indirect manipulation of particles is possible with electrophoresis, electroosmosis, dielectrophoresis, electrothermal flows, and induced charge electrokinetic phenomena. Papers both fundamental and applied in nature pertaining to the assembly of colloidal particles via these or closely related physical phenomena will be welcomed. Papers relating to the broad areas of microfluidics and colloidal crystallization are particularly desirable

Chair: Christopher L. Wirth
Department of Chemical Engineering
Carnegie Mellon University
Email: cwirth@andrew.cmu.edu

Co-chair: Stuart J. Williams
Department of Mechanical Engineering
University of Louisville
Email: stuart.williams@louisville.edu

T3010 Electroporation, Electrophysiology, and Cell Electrokinetics

Electroporation is a technique that employs pulsed electric fields to create nanopores across the lipid bilayer. Reversible pore formation has been recognized as a powerful means to introduce macromolecules such as DNA into cells while maintaining cell viability. Recently, irreversible electroporation, which results in cell death, has been used for the ablation of undesirable tissue. Results indicate that due to its non-thermal nature, IRE preserves important tissue components, such as the extracellular matrix, major blood vessels, and nerves. The talks within this session will deal with single cell analysis via micro-electroporation technology, cellular polarization, and in vivo applications of electroporation such as gene therapy and electrochemotherapy.

Chair: Rafael Davalos
Biomedical Engineering
Virginia Polytechnic Institute
and State University
Email: davalos@vt.edu

Co-chair: Trust Tariro Razunguzwa
Protea Biosciences
Email: trust.razunguzwa@proteabio.com

T3000 Award Session of the American Electrophoresis Society in Honor of Nancy Stellwagen

The Award Session honors people who have made significant contributions to electrophoresis and to AES, and whose work is well known in both the engineering and biology communities. Awardees receive a commemorative plaque and a lifetime membership to AES. Participation in this session is by invitation only.

Chair: Adrienne Minerick
Department of Chemical Engineering
Michigan Tech University
Email: minerick@mtu.edu

Co-hair: Edgar D. Goluch
Department of Chemical Engineering
Northeastern University
Email: e.goluch@neu.edu

T3013 Poster Session for the American Electrophoresis Society

The organizers of this session invite poster submissions in the area of electrophoretic technology and development. Topics of interest include new experimental or theoretical research involving any aspect of electrophoresis at either the macro-, micro-, and / or nano- scales. Late breaking submissions for the Poster Session will be accepted until **October 7th**. This year's poster session will include awards for the ***best student posters***, as determined by a distinguished panel of judges.

Chair: Victor Ugaz
Dept. of Chemical Engineering
Texas A&M University
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NEW THIS YEAR
CO-SPONSORED SESSIONS WITH AREA 1J

This year we are pleased to team up with our friends in Area 1J of AIChE to offer the following co-sponsored sessions. We are excited about this partnership and the expanded programming it will enable us to offer!

01J06, 01J10 Microfluidic and Microscale Flows I and II

These sessions of contributed talks will focus on microhydrodynamic phenomena in the low-Reynolds number regime. Topics will include studies of flow, particle manipulation, and heat and mass transfer in microfluidic devices.

Chair: Aditya S. Khair
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Email: akhair@andrew.cmu.edu

Co-Chair: Susan Daniel
Department of Chemical and Biomolecular Engineering
Cornell University
Email: sd386@cornell.edu

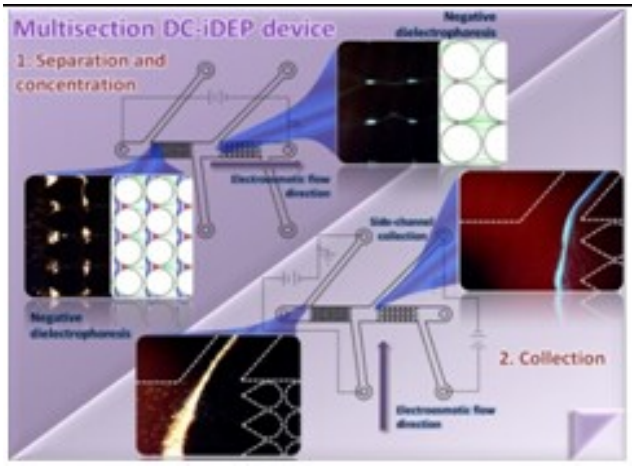
ANNOUNCEMENTS!

2012 SciX Conference Call for Papers Open:

SciX is a meeting hosted by The Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) that focuses on analytical chemistry and related sciences. For the second year, AES is co-organizing sessions with FACSS members to include such topics as dielectrophoresis, micro- and nanofluidics, new applications of conventional electrophoresis, and next generation electric-field driven separations. In particular, we are organizing the following joint sessions: i) Single Cells and Bioparticles, ii) Micro/nano Scale Analytics, and iii) Electric Fields and Fluids. The SciX meeting will be help September 30 – October 5, 2012 in Kansas City, MO. The organizers for the joint FACSS/AES session are Christa Hestekin (chesteki@uark.edu) representing AES and Wenwan Zhong (wenwan.zhong@ucr.edu) representing FACSS. The SciX call for papers in currently open and can be accessed here (http://www.scixconference.org/index.php/program/papers) with a deadline of April 20 for oral presentations and July 31 for poster presentations.

Call for Papers for Special Dielectrophoresis Issue:

You are invited to submit a paper for a special issue, **DIELECTROPHORESIS 2013,** to be published by the journal *Electrophoresis*. This will be a highly anticipated special issue; we encourage submission of articles covering all aspects of dielectrophoretic miniaturized systems. The tentative publication date of the DIELECTROPHORESIS 2013 issue is **April 2013**. Additional information and directions for authors are available on the web at: www.wiley-vch.de/home/electrophoresis. The **deadline** for manuscripts submission is **August 1st 2012**. Please submit your manuscripts electronically at: http://mc.manuscriptcentral.com/elpho, indicating that it is intended for this special issue, or contact the editor for this issue, Dr. Blanca Lapizco-Encinas, at blapizco@gmail.com.



The Trailing Zone by Victor M. Ugaz

A column highlighting broader perspectives and observations about science and the lives of those who pursue it.

The Maria Test

I was navigating the maze of evening hospitality receptions at a recent AIChE meeting when I came upon a colleague who introduced me to a friend of his. This friend seemed to already know who I was. He was very interested in a particular paper we had recently published and said something like, "You seem to do simple things but get them published in very good journals…what's your secret?"

The question caught me off guard. It somehow managed to be both complimentary and insulting at the same time. I fumbled for an answer, beginning on shaky ground with, "uh, I don't know," and quickly going downhill as I struggled to say something dignified and profound (choose interesting problems, go back to the fundamentals, etc.). Visibly unsatisfied with my feeble response, the friend eventually replied, "well, it looks like you're not going to tell me the secret," and abruptly moved on to join another conversation.

Finally able to make my way to the bar, I contemplated the encounter as I sipped my beer. I actually did have a secret, but I doubted that this person would be able to fully appreciate it. In the context of the publication in question, I had a very powerful secret weapon. I had Maria.

The idea that led to this paper came to me during a seminar in late 2004. I almost always find something interesting to take away from a seminar. Sometimes I focus on the presenters' style, how they weave their work into a story, how their slides are organized, or, as was the case on this occasion, I just draw on my paper. In my doodling, I was struck with an idea for a new way to mix liquids in microchannels (tiny capillaries with diameters approaching that of a human hair), a notoriously challenging feat because the flow is inherently laminar. One way to accomplish this is by splitting up the liquid flows into many smaller streams, then bringing them back together in alternating layers. This layering accelerates mixing by reducing the lateral diffusion length, but it also requires an intricate 3D flow network that can be challenging to build. I had sketched something that I believed could enable the same thing to be done in a 2D microchannel which, because it is planar, would be very easy to make. The original sketch is shown in Fig. 1 (the design as drawn is slightly flawed, but the concept was sound and we worked out the bugs later).

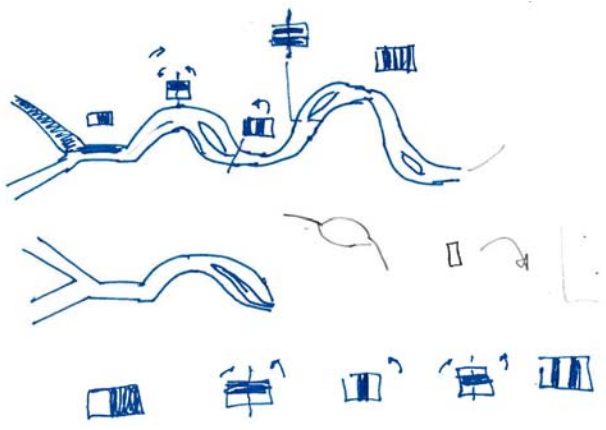


Fig. 1. An idea is born. Doodles made during a seminar suggested a new approach to mix liquids in microchannels.

The inter-layering mechanism on which this mixing approach is based is often illustrated by depicting a cross-section view of the layers as an alternating stack of black and white (imagine a baker kneading dough, folding it over, kneading again, etc…mathematically this idea is even described in terms of a so-called baker's map or baker's transformation). This seemed like a natural way to show the effect, and we proceeded to prepare illustrations along these lines (Fig. 2).

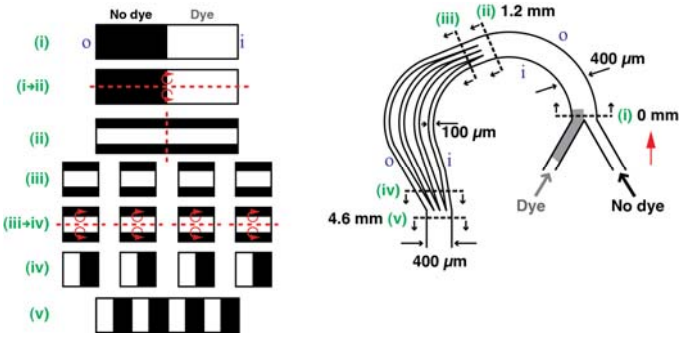


Fig. 2. Unsuccessful illustration. A mathematically-focused view didn't fully convey how the mixing process works, or how it differed from established methods.

I was so excited when we finally finished the paper, but as often happens we found that this enthusiasm was not shared by the referees who reviewed it. Why couldn't they see how special our breakthrough was? How could we open their eyes to it? It was clear that I needed a fresh perspective. An intelligent opinion, but at the same time an honest one, unfiltered by prior knowledge or biases about the particular field. Most importantly, I needed someone who could be counted on to tell me what they really thought, not what they believed I wanted to hear. I knew just the person for the job.

Maria was an undergraduate student who may not have been the top performer in class, but she repeatedly impressed me in conversations because I could tell that she had a high level of practical smarts, an attribute we call common sense. I also knew that she wasn't afraid to speak her mind. She

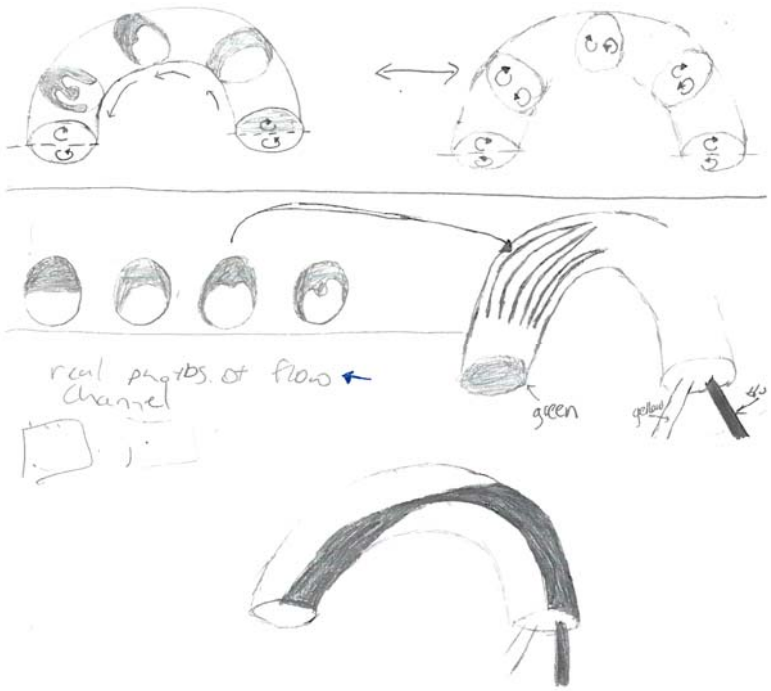


Fig. 3. A fresh perspective. Maria's sketches brought our ideas to life using a 3D depiction and by suggesting that we show actual images of the mixing process inside the flow network. We forgave her for doodling instead of paying attention in class.

would be the perfect person to tell me where we were going wrong. It was summertime and she happened to be on campus taking classes, so I enlisted her help to give me her opinion about our choice of figures to illustrate the mixing phenomenon. As soon as she saw Fig. 2 her response was immediate and emphatic: "I don't know what this figure is showing!" It took a few minutes for me to explain what was going on, after which I could see that she got it (and even thought it was a cool idea!).

The next day, I was shocked when Maria came to my office with papers in hand where, to my complete surprise, she had thought about it more on her own and even attempted to draw the kind of intermixing we were talking about (Fig. 3). She said she did it during her chemistry lecture. Probably not the greatest idea (although maybe she was inspired in the same way I was during the seminar when I made my drawings). But I thought her illustrations were absolutely gorgeous. They instantly made everything come alive.

This was exactly the breakthrough we needed! A 3D depiction like this would clearly show the process. We went through many more iterations before arriving at the final illustration (Fig. 4), but each step of the way we were inspired by Maria's vision. I even submitted one of her drawings as cover art for the journal. I knew it had little chance of being accepted, but I liked that it was honest and from the heart, something you don't see every day. Her contribution is credited in the acknowledgments of the paper "for exceptionally insightful discussions about how to visually depict the flow phenomena."

As scientists, it is easy to become so focused on the details in one area that we lose sight of the bigger picture. Sometimes it takes a fresh insight like Maria's to open our eyes to the beauty right in front of us—a beauty we too often forget to notice. I try to apply the "Maria test" to all my work. Unfortunately, it's not always easy to find this honest, unfiltered perspective. And it can be even more difficult to open your mind to accept the input.

Victor M. Ugaz (ugaz@tamu.edu) is Associate Professor and K. R. Hall Development Professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. Comments and suggestions are welcome.

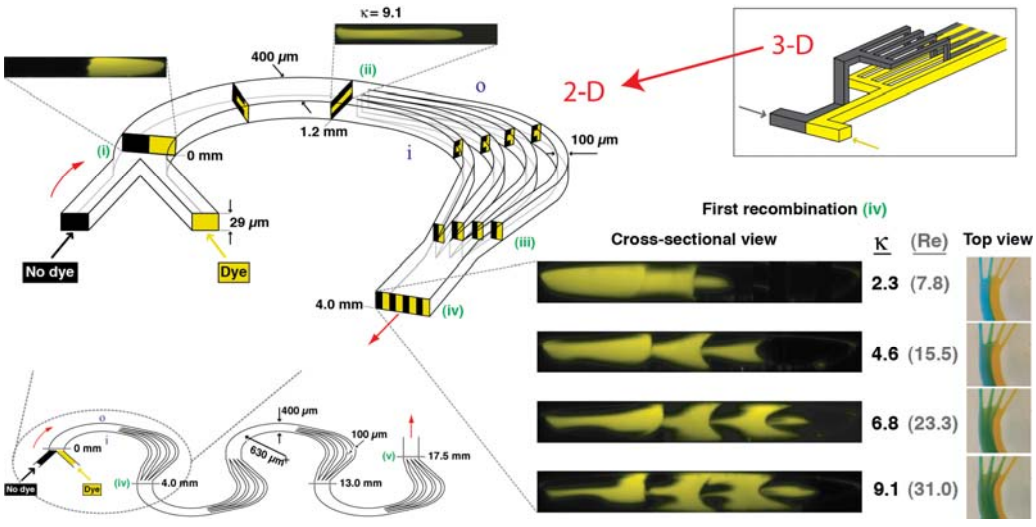


Fig. 4. Revised illustration. This one passed the Maria test! Sudarsan & Ugaz, *PNAS*, 103 (2006): 7228.

Notice something different?

The AES is now the "AES Electrophoresis Society"

The AES has experienced significant growth over the last few years such that our membership has increased significantly in number and breadth. We are now supporting more professionals, researchers, and academics in the areas of separation/detection with electrophoresis and related techniques.

With this positive trajectory and the AES Board's efforts to expand our society's reach, we recently voted to change the society name from American Electrophoresis Society to the AES Electrophoresis Society. We consider this name to have greater global appeal, which better represents the long term mission of our society to be a unique international organization dedicated to further the development of electrophoresis and related techniques as key components in many scientific investigations across a broad range of disciplines.

We are very optimistic about the future of AES; we invite you to reach out to your colleagues regarding the value you find in your AES membership. Our commitment is to continue benefiting our members with high quality programming through our symposia and technical workshops, important growth opportunities for our student members, and dissemination of relevant articles, announcements and career opportunities through our Newsletter, Forums, and Website. In addition, we have formed an alliance with the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) to support further benefits by bringing excellent symposia programming to our members.

AES discount for 2012 AIChE conference registration!

Soon, AES will email you detailed instructions on how to register at the AES member discounted rate. Your AES membership is valuable; it provides you with a significant discount on the AIChE registration fee. On average, AES members save $400 for full meeting registration and $180 for graduate student full meeting registration. Don't miss out on these important savings!
You will need your AES member number, which will be emailed to you along with the registration instructions.

Not a member? AES costs only $75 for full membership; $25 for students. **Join now at:** www.aesociety.org/apply/apply_online.php

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2011 AES Annual Meeting Focus Issue of ELECTROPHORESIS is coming in July:

We are pleased to inform that the focus issue containing papers presented at the 2011 AES Annual Meeting will be published in the journal *Electrophoresis* in July 2012, as issue 13 of volume 33. We would like to thank all the authors and reviewers that made this focus proceedings issue possible.

Blanca Lapizco-Encinas and Victor M. Ugaz
Guest Editors, AES Focus Proceedings Issue