



# ESA Newsletter

Electrostatics Society of America - The Friendly Society

## President's Message

Dear ESA Members:

I am delighted to let you know that ESA 2009 at Boston was another great success. This time it was a joint meeting with five organizations, including ESA. We had the pleasure of IEEE/IAS Electrostatic Processes Committee, Institute of Electrostatics, Japan, Societe Francaise of Electrostatique, France, and the International Electrostatics Assembly joining with us to host this meeting at greater Boston. We had 101 attendees from various countries including Algeria, Argentina, Botswana, Czech Republic, Korea and New Zealand. We are pleased to know that 25 of them were students, the next generation ESA experts.

So, my hearty first thanks to Mark Horenstein, our general conference chair, who in addition to being our web Master, also volunteered to host the 2009 meeting at beautiful Boston University. It was such a scenic route with beautiful roses and other flowers from the Holiday Inn and the Dormitory to the conference venue, the 9th floor of the Photonics Center, an incredible location, with the Charles River in our sight. Thank you Mark, for all your hard work and time for making all the local arrangements and making the conference a great success. Thanks are due to Mark's able assistants who served us tirelessly, meeting various demands of the conference including excellent AV arrangements, and answering the questions of the attendees and helping them in all possible ways

My next hearty thanks are to Kelly Robinson, the Technical Program Chair, who this time had twice the usual number of abstracts and papers to review, edit and accept. In addition, Kelly also printed all the 90+ papers in 200 CDs by himself and made it available at the lowest possible cost to us. Thank you very much Kelly, for all your dedication and continued great service to ESA. He was joined by Mark Zaretsky, our Newsletter Editor, who printed and labeled the CDs. Many thanks to Kelly and Mark.

Very many thanks are due to all the attendees who made the conference a great success, especially those who attended for the first time or rejoining us after several years. The conference started with an invited key note talk by M. Zahn of MIT on the timely topic of energy and nanotechnology, "Electron scavenging by nanoparticles in oil insulated power transformers". This was followed by other talks in a wide variety of session topics - the program may be found at <http://www.electrostaticanswers.com/2009ESJC/2009ESJC.htm>. These sessions were chaired by Edmund Devitt, Eric Moreau, Sheryl Barringer, Kaz Adamiak, Dan Lacks, Kazuo Shimizu, John Gagliardi, Maciej Noras, Mark Zaretsky, Mike Arnold, and Masaaki Okubo respectively and very special thanks are extended to all of them.

We had a very enlightening as well as entertaining tutorial on Lightning by our dear Glenn Schmieg, known to most if not all of you. I still could not believe that the width of the lightning was 1.5 inches (nylon socks may not give the true dimension, Glenn). This was followed by another exciting demo and lecture by Robert A Morse on "A New Electrostatics Toy for Demonstrations and Experiments". He also distributed a wonderful and enjoyable CD, "Franklin and Electrostatics: Ben Franklin as my lab partner".

My thanks are also due to S.Vella, who gave another exciting invited talk on using chemistry to manipulate contact electrification and electrical discharges. In addition we had two great poster sessions, the first with 26 and the second with 27 posters. I also take this opportunity to thank very much the anonymous donor who sponsored the buffet dinner during the second, late evening poster session.

So, a big thanks to all the Technical Program Committee Chairs of the five organizations for all their hard work and dedication in making such a successful technical program: Kelly Robinson (ESA), Tetsuji Oda (IEJ), Akira Mizuno (IEA), Rajesh Sharma (IEEE/IAS/EPC), and Gerald Touchard (SFE).

(cont'd. on page 2)

## President's Message (cont'd.)

Once again students had a good time at our ESA meeting. As you know, the registration fee was waived for student authors who were also presenters. There were 20 student presentations and several first, second, and third prizes were awarded. Special thanks are due to Bill Vosteen for his able management of the student paper competition and the other two judges, Hyan-Ha Kim and Amar Tilmatine, for their service and time. Again, this year we had more students due to the joint meeting, almost thrice the usual number of students, twenty in total. It was heartening to see that at least 6 or so were returning students. More details about student paper competition and the prizes are to be found on page 4.

As in the past few years, Mystic Tan donated a handsome amount for the student paper competition awards and all our thanks are due to Steve Cooper and his company for his continued generosity, in addition to serving as our treasurer for many years now and keeping our records and funds well.

This year we again had a nice selection of service awards and a great awards ceremony. We had four ESA Distinguished service awards, given to Al Seaver, Kelly Robinson, Mark Zaretsky, and Bill Vosteen for their long term contributions to ESA in their various capacities as ESA presidents, conference general chairs, technical program chairs, and newsletter editor. In addition, we had the pleasure of giving Mark Horenstein's distinguished service award at this conference (how appropriate!). Additionally, President's Appreciation awards were given to 11 volunteers for their excellent services: 1) Steve Cooper for his outstanding services as the treasurer since 2002. Steve has been doing a great job keeping our finance records and has invested our money well, gaining good returns, 2) Sheryl Barringer for her excellent service as a technical program chair. Nine awards were given to the spouses of many of our long time attendees and excellent volunteers for their support, co-operation, and service to ESA, in many forms and ways including the hospitality suite at 2008 ESA conferences and other services. They include, 1) Toni Seaver, 2) Elizabeth Adamiak, 3) Missi Bergen, 4) Lux Marina Calle, 5) Judy Castle, 6) Pat Jeffrey, 7) the late Judy Zaretsky, 8) Marsha Robinson, and 9) Grace Gagliardi. Thanks to all of you for your continuing service for many more years to come. We are soliciting nominations for next year's awards. The details of the various awards are available at <http://www.electrostatics.org/awards/index.htm>. Please send your nominations to our Vice-President and Awards Chair, John Gagliardi.

As usual, we had our special and fun attraction after the banquet; Glenn Schmeig entertained, and educated us with his informative presentation on food. I am sure like

me, you are also looking forward to next year's conference and Glenn's magic banquet presentation. Thank you so much, Glenn.

We had more than thirty new members in this year's conference, the majority of whom are student members, illustrating the bright future of ESA. Thank you all for joining and supporting ESA.

I know you are all looking forward to our next conference; it will be at the University of North Carolina, Charlotte, in June 2010 (the exact dates will be forthcoming). General conference chair for our 2010 conference is Maciej Noras and the Technical Program Committee chair is Dan Lacks, who will also be hosting the 2011 conference at Case Western Reserve University, Ohio.

I look forward to seeing all of you and additional new members at the 2010 and 2011 conferences. These annual events lie at the core of the ESA and its activities and so, please bring your colleagues and friends who are in this field.

Electrostatics pervades many fields including biotechnology, nanotechnology, and energy, with attractive applications, such as nanopore for cell sorting and electro-spinning for nanofiber fabrication. We constantly strive to serve you in many ways possible, such as the joint meetings, where you meet researchers from around the globe. As usual, we would also like to hear from you as to other ways we can serve. I look forward to hearing from you.

Thank you so much and have a very productive time.

Yours for the Friendly Society,

*Raji Sundararajan,*  
ESA President

## Calendar

✈ ESA-2010, June, 2010, Charlotte, NC Contact:  
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## ESA OFFICERS

### President:

Rajeswari Sundararajan, Purdue Univ.

### Vice President:

John Gagliardi, Rutgers Univ.

### Executive Council

Sheryl Barringer, Ohio State Univ.

Steve Cooper, Mystic Tan, Inc.

Kelly Robinson, Electrostatic Applications, LLC

# 2009 Electrostatics Joint Conference

## Wrap Up of a Successful Conference

The attendees have all arrived home safely, the papers have now been launched into the scientific community, the summer is half over (*now fully over due to the newsletter editor*), and the final bills are coming in. “Electrostatics 2009”, our first-of-a-kind joint conference of five different organizations: ESA, IAS-EPC, IEJ, SFE, and IEA, will hopefully serve as a model for future joint conferences. I would like to thank those who made the long trek to Boston from such far away places as Japan, New Zealand, Algeria, and Europe (not exactly far away, but you need a passport to get to Boston, so it must be a major trip). I thoroughly enjoyed hearing the technical talks, as did everyone with whom I have since spoken with. A huge “thank you” goes to Kelly Robinson for managing the large number of papers and ordering them into coherent sessions. Judging from the large number of emails that flew through cyberspace prior to June 15, his task was not an easy one. With respect to the more mundane but necessary tasks of feeding, housing, and transporting the attendees, I had many helpers who assisted in these various conference chores. Much appreciation goes to each of you. I would also like to thank Glenn Schmeig, our ever-present and ever fascinating banquet speaker. His innovative and interesting talks have become a grand ESA tradition.

Special thanks are due to a lifelong ESA member who wishes to remain anonymous. This generous individual made a sizable monetary contribution in support of our Wednesday evening poster session – an unexpected added expense that we learned was necessary after the registration fee had already been established and published. His kind support made a major difference in offsetting the cost of renting the easels and providing the bag lunches for the poster session. Individuals such as this person help the ESA earn its reputation as “The Friendly Society”.

Plans are already underway for next year’s ESA conference. Hope to see everyone there.

*Mark Horenstein*  
2009 General Conference Chair



Photo acknowledgments: thanks go to several folks (unnamed but not unappreciated) for taking pictures at the conference, and thanks to Al Seaver for posting all the photos (more than shown in this newsletter) on his website [http://electrostatics.us/esa/2009/page\\_01.htm](http://electrostatics.us/esa/2009/page_01.htm)

## ESA 2009 Student Paper Competition

Award	Student	University	Title	Faculty
1 <sup>st</sup>	Hsin-Fu Huang	MIT	Continuum Modeling of Micro-particle Electrorotation in Couette and Poiseuille Flows – the Zero Spin Viscosity Limit	Marcus Zahn
1 <sup>st</sup>	Mad Yazdina	Illinois Institute of Technology	Effects of Charges Mobility on EHD Conduction Induced Dielectric Liquid Flow	Jamal Seyed-Yagoobi
1 <sup>st</sup>	Matt Pearson	Illinois Institute of Technology	Experimental Study of EHD Conduction Pumping at the Micro-scale	Jamal Seyed-Yagoobi
1 <sup>st</sup>	Chitral Angamma	University of Waterloo	Effects of Electric Field on the Multi-jet Electro-spinning Process and Fiber Morphology	Shesha Jayaram
1 <sup>st</sup>	Sam Beardsmore-Rust	University of Sussex	Quantitative Measurement of Tribo-Electric Charging Phenomena of Dielectric Materials	H. Prance
1 <sup>st</sup>	Radu Beleca	Brunel University	Investigation of Electrostatic Properties of Dry Powder Drug Aerosols Using Phase Doppler Anemometry	Balachandran Wamadeva
2 <sup>nd</sup>	Petr Cervanka	Institute of Chemical Technology	Comparison of Slip and Non-slip Mathematical Models of AC Electroosmosis in Microchannels with Asymmetric Co-planar Electrodes	Dalimil Shita
2 <sup>nd</sup>	Jeremy Stark	University of Arkansas at Little Rock	Mathematical Simulation Study of Digital Signal Processing of the ESPART Analyzer for the Nanoparticle Size Range	Malay Mazumder
2 <sup>nd</sup>	Nikola Toljic	University of Western Ontario	Charge to Radius Dependency for Conductive Particles Charged by Induction	Castle and Adamick
2 <sup>nd</sup>	Ross Adelman	US Army	Basis Models for Complex Electrostatic Simulations	David Hull
2 <sup>nd</sup>	Keith Forward	Case Western Reserve University	Particle Size Dependent Charge Segregation of Triboelectrically Charged Granular Materials	Dan Lacks
2 <sup>nd</sup>	Hidetaka Ishihara	University of Arkansas at Little Rock	Electrochemical Synthesis of Titania Nanotube Array for Photoelectrochemical Hydrogen Production	Malay Mazumder
2 <sup>nd</sup>	Angela Antoniu	Tech Univ Gheorghe Asachi of Iasi & Univ of Poitier	Accelerated Discharge of Corona-charged Non-woven Fabrics	Lucian Dascalescu
3 <sup>rd</sup>	Takuya Miura	IRLCom Lab	Analysis of the Inactivation Mechanism of Bacteriophage by Atmospheric Barrier Discharge	Akira Mizuno
3 <sup>rd</sup>	Yoshiyuki Teramoto	Tokyo University	Laser-induced Fluorescence of N <sub>2</sub> <sup>+</sup> Metastable in Various Gas Pulsed Positive Corona Discharge	Tetsuji Oda
3 <sup>rd</sup>	Satoshi Sato	Toyohashi University of Technology	Diesel Exhaust Gas Treatment by Honeycomb Discharge	Akira Mizuno
3 <sup>rd</sup>	Xuri Yan	Boston University	Investigation of Electrospun Fiber Diameter Distribution and Process Dynamics	Michael Gevelber
3 <sup>rd</sup>	Hideaka Hayashi	Toyohashi University of Technology	Collection of Diesel Exhaust Particle Using Electrostatic Charging Prior to Mechanical Filtration	Akira Mizuno
3 <sup>rd</sup>	Isias Ramirez	University of Waterloo	Thermal Conductivity of Silicone Rubber Nanocomposites	Shesha Jayaram
3 <sup>rd</sup>	Funian Xiao	Purdue University	Electrically-Enhanced Chemodrug Delivery to Human Breast Cancer Cells	Raji Sundararajan

# 2009 ESA Annual Conference Reflections

## Speakers



# Around The Tables



# At The Banquet



# Awards Ceremony



ShapeCollage.com

## Current Events

### More than one nanostring to their bow: Scientists moving closer to “artificial noses”

LMU Munich

(excerpted from ...

<http://www.en.uni-muenchen.de/news/research/kotthaus.html>)

These days, chemical analysts are expected to track down even single molecules. To do this highly sensitive detective work, nano researchers have developed minute strings that resonate in characteristic fashion. If a molecule docks onto one of the strings, then it becomes heavier, and its oscillations become measurably slower. Until recently, however, such “nano-electromechanical systems”, or NEMS, have been short of practical applications. Physicists at LMU Munich have now made a breakthrough in this field: They have constructed a system of nanostrings made of non-conducting material, where each string can be electrically excited separately. Thousands of these strings can be produced on a small chip. One of the devices that could be created with this system is a highly sensitive “artificial nose” that detects various molecules – pollutants for example – individually. These new NEMS could also be used in a multitude of other applications – acting as tiny pulse generators in mobile phone clocks, for example.

Quick, certain and cheap detection of single molecules is a task that chemical analysts are now expected to perform. Luckily, there is a method they can employ for this, which uses nanotechnology: Specifically, they use “nano-electromechanical systems”, or NEMS. These systems involve strings with diameters of the order of 100 nanometers – a ten-thousandth of a millimeter or a 1/500 of a human hair – which can be excited to resonate in a characteristic fashion. If these strings are coated with the right kind of chemicals, then molecules will dock onto them. More specifically: only one kind of molecule can dock onto each string.

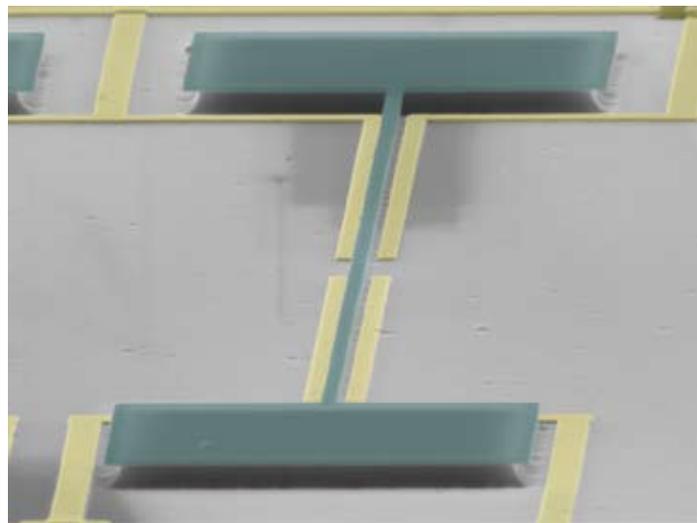
When a molecule docks onto a string, the string becomes heavier and its oscillation slows down a tiny bit. “By measuring the period of oscillation, we could therefore detect chemical substances with molecular precision,” explains Quirin Unterreithmeier, first author of the study. “Ideally, you would have several thousand strings sitting on a chip the size of a fingernail, each one for highly specifically recognizing a single molecule – so you could build an extremely sensitive ‘artificial nose’, for example.”

Until recently, however, getting such systems to work has proven technically difficult; one problem being to produce and measure the oscillations. While the nanostrings can be made to oscillate by magnetomechanical, piezoelectric

or electrothermal excitement, this only works if the nanostrings are made of metal, or are at least metal-coated, which in turn greatly dampens the oscillations, preventing sensitive measurement. That hardly allows the detection of a single molecule. It also makes it harder to distinguish the different signals from differently oscillating strings.

The newly developed method now avoids these difficulties. Quirin Unterreithmeier, Dr. Eva Weig and Professor Jörg Kotthaus of the Center for NanoScience (CeNS), the Faculty of Physics of LMU Munich and the cluster of excellence “Nanosystems Initiative Munich (NIM)” have constructed an NEMS in which the nanostrings are excited individually by dielectric interaction – the same phenomenon that makes hair stand on end in winter. Following this physical principle, the nanostrings, which are made of electrically non-conducting silicon nitride, are excited to resonate when exposed to an oscillating inhomogeneous electric field, and their vibration then measured.

The alternating electric field required for this stimulation was produced between two gold electrodes right up close to the string. The oscillations were measured by two other electrodes. “We created this setup using etching techniques,” reports Weig. “But this was easily done – even repeated ten thousand times on a chip. The only thing to do now is to make sure the strings can be individually addressed by a suitable circuit.” All in all, this ought to be a technically easy exercise – but one that will allow a breakthrough in chemical analysis. Yet there are even more applications that can be seen beyond this “artificial nose”. Among other things, the nanostrings could be employed as the pulse generators in mobile phone clocks, for example. These novel resonators could even be used as ultra-sharp electrical signal filters in metrological systems.



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**ESA-2010 Annual Meeting: June, 2010  
University of North Carolina, Charlotte, NC**