Jan/Feb 2013 • No. 217

ESA Newsletter

Electrostatics Society of America - The Friendly Society

President's Message

Dear Colleagues,

Last month I welcomed two new members to my research group. I initially met them at ESA meetings, where they presented papers as students. Their trajectory to my group was guided by their PhD research advisors, who I also got to know from ESA meetings.

Dr. Mihai Bilici joined my group in early January as a postdoctoral research associate. Mihai completed his PhD in December, which he worked on jointly at Technical University of Cluj-Napoca (Romania) and the University of Poitiers (France). I first met Mihai at the 2011 ESA meeting in Cleveland, and I heard great things about him from his PhD advisor, Prof. Lucien Dascalescu, who attended the 2010 and 2012 ESA meetings. I recently started a project with a company to study particle charging issues that affect their processes, and I needed to hire a researcher for this project. Mihai was a great fit for this position, due to his strong research experience in particle charging. In fact, I speculate that Mihai was the best fit of anyone in the world for this position.

Maija Nyström began working with me a few days after Mihai started. Maija is a PhD student at the University of Turku (Finland), where she works with Prof. Matti Murtomaa. Maija is here for three months, in what is essentially 'student sabbatical'. I first met Maija at the 2010 ESA meeting in Charlotte. I have ran into Maija several times since, and I have been very impressed with her scientifically. Maija develops electrospraying techniques to produce pharmaceutical powders with low levels of crystallinity. Having Maija spend time in my research group is a great opportunity for me, as this interaction will help us expand our research capabilities into electrospraying.

I am fortunate that my involvement in the ESA meetings allowed me to recruit such excellent colleagues.

It's time to start making your plans for the 2013 ESA Meeting. The meeting will be held June 11-13, 2013, in Cocoa Beach, Florida. Dr. Charlie Buhler is hosting the meeting. Charlie arranged for the meeting to be held in a hotel right on the Atlantic Ocean, and the meeting will include a visit to the NASA Kennedy Space Center.

Now is the time to submit your abstract -- the deadline is March 1. Abstracts can be submitted online at http://electrostatics.org/conferences.html. Prof. David Go, from the University of Notre Dame, is the Technical Program Chair for the meeting. You can email David at dgo@nd.edu if you have questions about the abstracts.

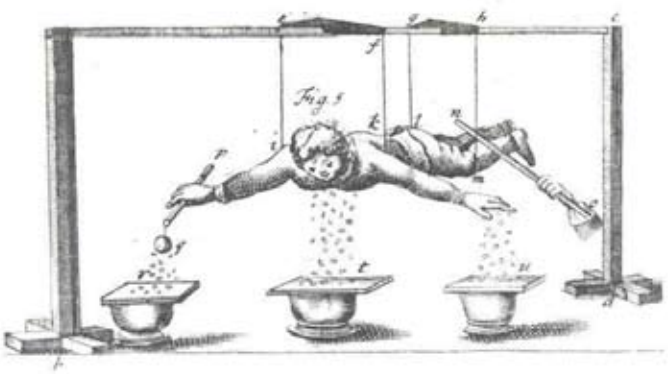
I hope to see you in Cocoa Beach in June!

Regards,
Dan Lacks,
President, ESA
daniel.lacks@case.edu

ESA Officers

President:
Dan Lacks, Case Western Reserve Univ.
Vice President
Shesha Jayaram, Univ. of Waterloo
Executive Council
Sheryl Barringer, Ohio State Univ.
Kelly Robinson, Electrostatic Answers, LLC
Rajeswari Sundararajan, Purdue Univ.

Dynamics of Electrostatics



In a famous experiment Stephen Gray demonstrated static electricity by charging a boy suspended by insulating strings in 1744.

Calendar

- 12th Int'l. Conf. of Electrostatics, Electrostatics - 2013, April 2013, Budapest, Hungary, *info@electrostatics2013.org* , *http://www.electrostatics2013.org/*
- ESA 2013, June 11-13, 2013, Cocoa Beach, Florida, USA, Charlie Buhler, *charles.r.buhler@gmail.com* , *http://electrostatics.org/conferences.html*
- EOS/ESD 35th Annual Symposium, Sept. 8-13, 2013, Las Vegas, Nevada, USA, Lisa Pimpinella, *info@esda.org, http://www.esda.org/*
- 13th Int'l Conf on Electrostatic Precipitation (XIII ICESP), Sept. 16-21, 2013, Bangalore, India, S. Seetharamu, *icesp2013@gmail.com, http://icesp2013.in (manuscript deadline Mar 15)*
- IEEE-IAS Annual Mtg., Oct. 6-11, 2013, Orlando, Florida, Lucian Dascalescu, *lucian.dascalescu@univ-poitiers.fr, http://ewh.ieee.org/soc/ias/2013/ (abstract deadline Mar 1)*
- 2013 IEEE CEIDP, Oct. 20-23, 2013, Shenzhen, P.R. China, *Mahmoud.Abou-Dakka@nrc-cnrc.gc.ca.,* http://www.ewh.ieee.org/soc/dei/ceidp/ceidp2013.htm *(abstract deadline Feb. 15)*
- ESA 2014, June 17-19, 2014, Univ. of Notre Dame, South Bend, Indiana, USA, David Go, *dgo@nd.edu*

Election of ESA Council Members

The ESA Bylaws provide for the election of officers every two years. Members vote for a complete slate of candidates at the annual meeting, and anyone is eligible to nominate or be part of a slate.

At this time, we have one nominated slate of candidates for this years election:

Slate of ESA Officers for 2013-2015
President
Dan Lacks, Case Western Reserve Univ.
Vice President
Shesha Jayaram, Univ. of Waterloo
Executive Council
Sheryl Barringer, Ohio State Univ.
Kelly Robinson, Electrostatic Answers, LLC
Rajeswari Sundararajan, Purdue Univ.

If anyone would like to nominate an alternate slate, please inform me well before the June conference so that we can prepare election materials for the business meeting. Absent an alternate slate, we will likely approve the current nominated slate by acclamation.

Dan Lacks, ESA President
daniel.lacks@case.edu

ESA Elections By-Laws - New Council Slates Are Sought

Based on Article 4 of the ESA Constitution, the term of the present ESA Council ends on June 30, 2013 and the new Council term of office begins on July 1, 2013. It is now time for the Secretary (address found on back page of this ESA Newsletter) to receive slates of nominees for the upcoming (7/1/13 - 6/30/15) term.

Since the Council shall be nominated as a full slate, the presenter of that slate is responsible for checking with all the members of that slate to insure each nominee is willing to serve. A slate consists of five members: the President, the Vice-President and three Council Members.

If more than one slate is presented to the Secretary, a ballot will be mailed out about April 30 (or as soon as reasonably possible) with the deadline for receipt of the ballots by the Secretary being May 31, 2013. If only one slate is presented (then as tradition has held) no ballots will be mailed, and the Membership present at the ESA Annual Meeting will be asked to vote on the slate. If no slates are presented, then, as Article 4b states, "If extraordinary circumstances prevent the election of a new Council, the existing Council shall continue in office, year by year, until an election can be held."

2013 Annual Meeting of the Electrostatics Society of America

Cocoa Beach, FL, June 11-13, 2013

The Electrostatic Society of America (ESA) invites papers in all scientific and technical areas involving electrostatics for the 2013 Annual Meeting of the ESA. Contributions range from fundamental physics and new developments in electrostatics to applications in industry, atmospheric and space sciences, medicine, energy, and other fields.

Anticipated Technical Session Topics

- Breakdown phenomena and discharges
- Electrically-induced flows and electrokinetics
- Contact charging and triboelectric effects
- Gas discharges and microplasmas
- Atmospheric and space applications
- Biological and medical applications
- Materials synthesis, processing, and behavior
- Measurements and instrumentation
- Safety and hazards

Keynote Speakers

We are excited to have an excellent slate of keynote speakers including:

· Prof. Mounir Laroussi, Old Dominion University
· Prof. Bruce R. Locke, Florida State University
· Prof. Tatsushi Matsuyama, Soka University
· Prof. Poupak Mehrani, University of Ottawa

Registration and Housing Information: The conference and housing will be located at **DoubleTree by Hilton Cocoa Beach Oceanfront,** 2080 N. Atlantic Ave. Cocoa Beach, FL 32931

Special Events: Conference includes the ESA banquet and a special tour of NASA Kennedy Space Center.

Abstract Submission: Online submission at http://www.electrostatics.org

Student Paper Competition: Presentations by undergraduate and graduate students are eligible for the Student Paper Competition. Please indicate participation when submitting abstract.

Important Dates

March 1, 2013	*Abstract submission deadline*
March 15, 2013	*Notification of abstract acceptance*
May 10, 2013	*Early registration deadline*
May 17, 2013	*Final manuscript deadline*

Contact Information

General Chair
Dr. Charles Buhler (charles.r.buhler@gmail.com)
CRB High Field LLC

Technical Chair
Prof. David B. Go (dgo@nd.edu)
University of Notre Dame

ESA Award Nominations

The ESA is accepting nominations for the following awards:

The **ESA Distinguished Service Award** recognizes outstanding service to the ESA over an extended period of time, with a demonstrated long-term commitment to the growth and continued well-being of the Society (requirement: 10 years as ESA member).

The **ESA Lifetime Achievement Award** recognizes outstanding contributions to the field of Electrostatics, as shown by the pervasiveness of the contributions in understanding certain problems or important practical benefits resulting from the work (requirement: 10 years working in field of Electrostatics).

The **ESA Honorary Life Member Award** recognizes exceptional contributions to both the ESA and to the field of Electrostatics, sustained over much of a career (requirements: 10 years as ESA member, 20 years working in field of Electrostatics).

The **Teacher of the Year Award** recognizes outstanding teachers who use Electrostatics to stimulate learning, inspire students, or otherwise encourage and energize the learning process in a formal educational setting in grades K-12 (requirement: 3 years teaching Electrostatics).

The **Student of the Year Award** recognizes middle or high school students who demonstrate outstanding achievement in Electrostatics, as showcased in laboratory projects, papers or presentations.

The ESA is also accepting nominations for induction to the Electrostatic Hall of Fame. This honor recognizes and records for posterity those individuals who have made extraordinary contributions to the field of Electrostatics. Nominees do not need to be still living. The Hall of Fame has three categories: (1) advancement of the fundamental knowledge of Electrostatics; (2) promotion of interest in the field of Electrostatics; (3) innovations using Electrostatics technology in industry.

Nominations should be submitted electronically to the ESA Award Chair, , Prof. Raji Sundararajan at *rsundara@purdue.edu*, by April 15. The nomination should be in the form of a letter from an ESA member that includes a description of how the accomplishments of the nominee satisfy the award requirements (including citations of publications or patents when relevant), the contact information of the nominator and nominee, and the names and contact information of 3 other ESA members who endorse the nomination. For the Teacher and Student awards, endorsements from two faculty members of the nominee's should substitute for the ESA member endorsements.

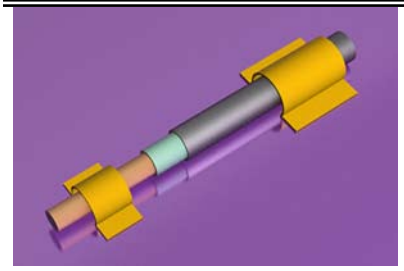
Current Events

'Nanocable' could be big boon for energy storage

Jade Boyd

Thanks to a little serendipity, researchers at Rice University have created a tiny coaxial cable that is about a thousand times smaller than a human hair and has higher capacitance than previously reported microcapacitors.

"We didn't expect to create this when we started," said study co-author Jun Lou, associate professor of mechanical engineering and materials science at Rice. "At the outset, we were just curious to see what would happen electrically and mechanically if we took small copper wires known as interconnects and covered them with a thin layer of carbon."

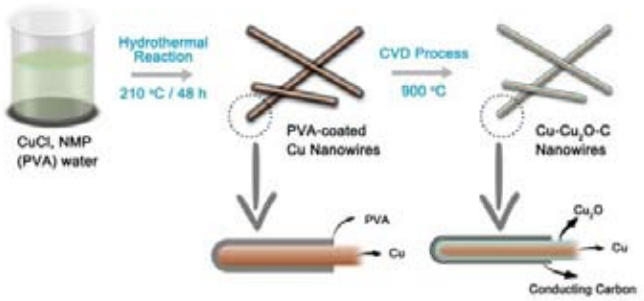


An artist's impression of Rice University's new coaxial nanocable, which is about a thousand times smaller than a human hair.

The tiny coaxial cable is remarkably similar in makeup to the ones that carry cable television signals into millions of homes and offices. The heart of the cable is a solid copper wire that is surrounded by a thin sheath of insulating copper oxide. A third layer, another conductor, surrounds that. In the case of TV cables, the third layer is copper again, but in the nanocable it is a thin layer of carbon measuring just a few atoms thick. The coax nanocable is about 100 nanometers, or 100 billionths of a meter, wide.

While the coaxial cable is a mainstay of broadband telecommunications, the three-layer, metal-insulator-metal structure can also be used to build energy-storage devices called capacitors. Unlike batteries, which rely on chemical reactions to both store and supply electricity, capacitors use electrical fields. A capacitor contains two electrical conductors, one negative and the other positive, that are separated by thin layer of insulation. Separating the oppositely charged conductors creates an electrical potential, and that potential increases as the separated charges increase and as the distance between them – occupied by the insulating layer — decreases. The proportion between the charge density and the separating distance is known as capacitance, and it's the standard mea-

Current Events (cont'd.)



The three-layer coaxial nanocable contains a solid copper wire surrounded by a layer of copper oxide that is encased a layer of carbon just a few atoms thick.

sure of efficiency of a capacitor. The study reports that the capacitance of the nanocable is at least 10 times greater than what would be predicted with classical electrostatics.

When the project began 18 months ago, Rice postdoctoral researcher Zheng Liu, the lead co-author of the study, intended to make pure copper wires covered with carbon. The techniques for making the wires, which are just a few nanometers wide, are well-established because the wires are often used as "interconnects" in state-of-the-art electronics. Liu used a technique known as chemical vapor deposition (CVD) to cover the wires with a thin coating of carbon. The CVD technique is also used to grow sheets of single-atom-thick carbon called graphene on films of copper. "When people make graphene, they usually want to study the graphene and they aren't very interested in the copper," Lou said. "It's just used a platform for making the graphene." When Liu ran some electronic tests on his first few samples, the results were far from what he expected. "We eventually found that a thin layer of copper oxide — which is served as a dielectric layer — was forming between the copper and the carbon," said Liu. The three-layer coaxial nanocable contains a solid copper wire surrounded by a layer of copper oxide that is encased a layer of carbon just a few atoms thick.

Upon examining other studies more closely, the team found that a few other scientists had made mention of oxidation occurring on the copper substrates during graphene production. "It's fairly well-documented, but we couldn't find anyone who'd done a detailed examination of the electronic properties of such complex interfaces," Ajayan said.

The capacitance of the new nanocable is up to 143 microfarads per centimeter squared, better than the best previous results from microcapacitors.

(excerpted from *http://news.rice.edu/2012/06/07/nanocable-could-be-big-boon-for-energy-storage/*)

Outside a Vacuum: Model Predicts Movement of Charged Particles in Complex Media

Picture two charged particles in a vacuum. Thanks to laws of elementary electrostatics, we can easily calculate the force these particles exert upon one another, and therefore predict their movements. Submerge those particles in a simple medium — say, water — and the calculation grows more complex. The charged particles' movements influence the water, which in turn may slow, speed, or otherwise alter the particles' paths. In this environment a prediction must also consider the water's reaction, or its dielectric response. But in real biological and material systems, media are also complex: plant cells and blood cells, for instance, are made up of several media and may be oddly shaped. This heterogeneity has made predicting the movement of charged particles in complex environments extremely challenging for theoretical physicists. Now researchers at Northwestern University's McCormick School of Engineering have developed a model that can predict the reactions of charged particles in any media.

Creating molecular simulations in heterogeneous media requires two steps: measuring the effects of the medium's dielectric response on the charged particles and measuring the effects of the charged particles on the medium's dielectric response. In previous attempts at such simulations, models treated the two calculations separately, completing one set of calculations before turning to the next. This process required solving a differential equation that governs the motion of the charged particles — namely, the Poisson equation — at each step of the simulation. The Northwestern researchers have developed a new, faster way that avoids the Poisson equation entirely. Using insight gleamed from nature, they have reframed the electrostatic problem as an energy-minimizing problem. "Nature doesn't wait to figure out the response of the medium in order to move the charged particles, nor does it wait to position the particles before determining the response of the medium," said Olvera de la Cruz. "The dielectric response and the motion of the charged particles are inherently coupled, and our model mirrors that."

The researchers formulated a new function that gives the correct response of the medium and produces the true energy of the charged particles. This enabled them to update the position of the charged particles and the medium's response in the same simulation time step. Within this theoretical framework and simulation design, they were able to attack problems that were previously intractable.

(excerpted from *http://www.mccormick.northwestern.edu/news/articles/2012/11/olvera-de-la-cruz-predicting-movement-of-charged-particles-in-complex-media.html*)

Electrostatics
Society of America

30 Shalimar Drive
Rochester, NY 14618

ESA Information

ESA Home Page: *http://www.electrostatics.org*

Dan Lacks
ESA President
Department of Chem. Eng.
Case Western Reserve Univ.
Cleveland, OH 44106
(216)368-4238
daniel.lacks@case.edu

Steve Cooper
Secretary/Treasurer
540 Morton Rd.
Athens, GA 30605
706-255-5518
steve@mt-ind.com

Mark Zaretsky
Newsletter Editor
30 Shalimar Drive
Rochester, NY 14618
585-588-6351
mark.zaretsky@kodak.com

!!SAVE THE DATE!!
ESA-2013 Annual Meeting
June 11-13, 2013
Cocoa Beach, FL, USA