January/February 2007 • No. 183

ESA Newsletter

Electrostatics Society of America - The Friendly Society

President's Message

I hope that you are planning to come to our 2007 Annual Meeting at Purdue University in West Lafayette, Indiana. We will be returning to the mid-West for the first time since our 2002 Meeting in Evanston, Illinois. Prof. Raji Sundararajan, General Chair, and Prof. Sheryl Barringer, Technical Chair, are working hard to make our 2007 Annual Meeting a great success. Our Annual Meetings are important events. Authors will make great presentations on their latest work, we will renew friendships during breaks and meals, and we will have many opportunities to establish new collaborations. Please consider joining us.

Snow is flying in upstate New York and I notice that my glasses fog when I come in from the cold. While my humidifier must be working, I notice that I still initiate sparks to my cat and to my computer. Static problems are often more severe in the winter when humidity is low. Certainly, this must be due to the strong relationship between conductivity and relative humidity. Conductivity is one of the most widely varying of material properties. The conductivity of metals is on the order of 10+7 S/m whereas the conductivity of good insulators is on the order of 10-20 S/m. What other aspect of matter varies by 27 orders of magnitude yet still may be held in your hands over its range of variation?

Perhaps there is more to "winter static" than conductivity. I have found it helpful to think about "static issues" as having two components; charge separation and charge dissipation. Conductivity determines how quickly charge dissipates. Charge separation, as characterized by the triboelectric series, for example, relates to the amount of charge on the surfaces of two materials that contact and separate. Clearly the moisture content of air strongly affects charge dissipation. Does tribocharging also vary strongly with relative humidity? Is there a simple experiment that would answer this? We would need to be sure that the results would not be compromised by the strong effect of moisture on charge dissipation.

Electrostatics is a fascinating topic. I'm looking forward to our Annual Meeting where I'll learn and think about many interesting aspects of electrostatics. I hope to see you there.

Kelly Robinson,
ESA President

CALL FOR PAPERS

2007 Electrostatics Society of America Annual Meeting

June 12 - 14, 2007
Purdue University, West Lafayette, Indiana USA

The 2007 Electrostatics Society of America (ESA) Annual Conference will be held on the campus of Purdue University in West Lafayette, Indiana starting 1pm on Tuesday, June 12 and ending after the banquet on Thursday, June 14, 2007. Join us for our technical sessions including comprehensive technical papers, a Student Paper Competition, informal discussions, poster sessions, and electrostatics demonstrations.

TOPICS OF INTEREST INCLUDE:

- Atmospheric Electricity
- Biological Applications
- BioMEMS and BioFluidics
- Breakdown and Discharges
- Charge Neutralization
- Computational Methods
- Display Devices
- Electrets
- Electrohydrodynamics
- Electrophotography
- Electrostatic effects in drug delivery
- Electrostatic Painting
- Electrostatic Powder Coating
- Electrostatic microencapsulation
- Electrophoresis
- Electroviscous effects
- Electrostatic Printing
- Electrostatic Propulsion
- Electrostatics Demonstrations
- Electrostatics Education
- ESD Prevention and Detection
- MEMS Devices
- Nonthermal Plasmas
- Nanoelectrospray applications
- Particle Control & Transport
- Precipitators and Cleaners
- Safety and Hazards
- Sprays and Droplets
- Triboelectrification

DEADLINES:

Mid - February	Registration and detailed conference information will be available at www.electrostatics.org.
March 1, 2007	Titles, abstracts and name of 1 - 2 relevant subject area from the list above are due to www.electrostatics.org.
March 16 , 2007	Notification of Paper Acceptance
April 13, 2007	Final Manuscripts due. Send final manuscripts to: electro@electrostatic.com Instructions for authors are available at www.electrostatics.org, along with templates for MS Word and Latex.

♦ Authors may request that their manuscript be considered for publication in the Journal of Electrostatics.

STUDENT PAPER COMPETITION:

To encourage participation by student researchers, all presentations that have a student as the presenter and first author are eligible for the student paper competition. Note the student must attend and present at the meeting. Undergraduate and graduate students are eligible. Papers will be judged on their technical merit and the cogency of their presentation. Please indicate at submission that the abstract is to be considered for the student paper competition, and list all student authors.

Contact the General Chair for information regarding transportation and accommodations, or the Technical Chair for information regarding the technical sessions:

Prof. Rajeswari (Raji) Sundararajan (General Chair)
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NOTE: Change of Conference Schedule

This year's annual meeting will take place at Purdue, IN, with slightly different dates. The conference will be begin at 1 pm on Tuesday, June 12 and end with the banquet on Thursday night, June 14. This will allow people to travel on Monday night or Tuesday morning, and return home on Friday morning. As usual, the banquet will be the highlight of the conference, with a stimulating speaker and awards ceremony.

Sources and Sinks

Electrostatics and the Science of Self-Assembly

One advantage of living in Delaware is that it's close to everywhere on the east coast. So, last June, when I decided to attend a conference in western Massachusetts, I opted to drive rather than fly. Preferring the back roads to the interstate, I found myself on Massachusetts Route 116, somewhere outside of South Hadley, when an irresistible sign crying "Dinosaur Tracks" caught my eye. I followed its arrow down a small two-lane road and then a second arrow down an even smaller gravel track winding into the woods. At the end of the road stood a well-aged small white shack, an outhouse, and a big green dumpster. It didn't look promising. But, when I stepped inside the shack, startling the old woman who owns and runs the site, I found one of the neatest little rock shops I've ever had the pleasure to visit. I did pay my two dollars and fifty cents for the right to hike through the mud and the rain to view the somewhat disappointing Nash Dinosaur Tracks, but I spent most of my visit picking through the barrels and trays of rocks and minerals back in the shop. My find of the day was a cheap chunk of amber, perfect for rubbing with wool and making small bits of paper dance.

Over the last year, as I finished writing Self Assembly: The Science of Things That Put Themselves Together, I've kept that piece of amber on my desk. Sometimes it's served as a worry stone, but more often it's served as a reminder that the connections between the newest and hottest topics in science, like nanotechnology and self-assembly, and the oldest and richest disciplines, like electrostatics, run deep and strong. It's these connections, specifically the connections between electrostatics, nanotechnology, and self-assembly, that I'd like to talk about in the rest of this article.

By now, everyone is familiar with nanotechnology. The excitement has not only permeated the scientific community, but popular culture as well. The movie The Hulk updated the science of the original television series, using "nanobots" in place of "gamma rays" to create the green monster. Michael Crichton's Prey gave us a glimpse of adaptive, intelligent "nanoswarms" run amok. And, even Jackie Chan has gone nano, with his high tech nano-enabled suit in The Tuxedo. But, despite all of the hype there are many scientific challenges that must be overcome if "nanobots" and "nanoswarms" are to become reality. The most serious of these is the manufacturing challenge.

Simply put – how do we build small? Standard "top-down" manufacturing techniques, the lithographic methods that have driven the microcomputer revolution, are rapidly reaching their limits. Further, they are inherently two-dimensional, and difficult, if not impossible to adapt to building complex three-dimensional nanoscale structures. The most promising alternative is the "bottom-up" bio-mimetic strategy known as self-assembly. In this approach, small, simple components are designed so that when placed in the proper environment, they spontaneously organize themselves into complex functional nanostructures.

At first glance, self-assembly seems magical. Somewhat like shaking a box full of puzzle pieces and opening it to find that the puzzle has assembled itself. But, when we look to nature, we see that this is precisely the strategy that she has adapted to build an incredibly diverse range of both inorganic and organic structures. One of the best understood examples of this is the assembly of the common Tobacco Mosaic Virus (TMV). This virus consists of one type of protein subunit and a single strand of RNA. The protein subunit is wedge shaped. When a collection of these subunits are placed in solution, binding sites on the surface of the proteins cause them to self-assemble into a double-layered "washer" configuration. Each individual washer consists of seventeen of the wedge shaped protein subunits and the double-layer is comprised of two washers stacked one on top of another. When the RNA strand encounters a washer, it causes it to change its shape – the washer becomes a "lock-washer." In this configuration, the lock-washer structures can stack, bind, and encase the RNA in a protective helix of protein. This self-assembled helically bound RNA, the Tobacco Mosaic Virus, has been created in the laboratory and found to be identical to naturally occurring TMV. The ability to self-assemble is an intrinsic property of the system.

Like the Tobacco Mosaic Virus, every self-assembling system consists of four key parts: particles, a binding force, a driving force, and an environment. In many such systems, the electrostatic force plays the role of the binding force, the driving force, or both. A good example of this is provided by the self-assembling nanowires developed by a group at Harvard University (Applied Physics Letters, 74 (1999), pp. 2699-2701). In this system, carbon nanoparticles are dispersed between a pair of electrodes immersed in toluene. When a potential difference is applied the carbon nanoparticles self-assemble into a straight wire spanning the gap between the electrodes. In this system, the particles are the carbon nanoparticles, the binding force is electrostatic, the driving force is the applied electric field, and the environment consists of the toluene solution plus the electrodes. While the structure formed in the Harvard experiments was a simple one, other researchers have shown that the same basic system can produce complex dendritic structures with

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Sources and Sinks (cont'd.)

Electrostatics and the Science of Self-Assembly (cont'd.)

underlying fractal geometry (Science, 294 (2001), pp. 1082-1086).

Still, nanoscale dendrites are a far cry from self-aware nanobots. But, researchers from a wide variety of disciplines are starting to bridge the gap. Self-assembled polyhedra have been formed from DNA, the world's smallest transistor was self-assembled, and most recently, tiny smiling faces, only a hundred nanometers across, were created by self-assembly. Great progress has been made, but much remains to be done, and much of the potential of nanotechnology and self-assembly can only be unlocked through a deeper understanding of the "old" discipline of electrostatics.

John A. Pelesko
University of Delaware, Newark, Delaware
John A. Pelesko is an Associate Professor in the Department of Mathematical Sciences at the University of Delaware. His new book, Self Assembly: The Science of Things That Put Themselves Together, will be released by Chapman & Hall/CRC in May 2007.

A Crossroad in Technical Publishing - Part II: Open Access

In the last ESA Newsletter (Nov/Dec 2006, No 182, http://www.electrostatics.org/newsletters/nov-dec-06-esa-newsletter.pdf) I discussed in Part I the cost problem associated with scientific publications. Essentially the $35 to $40 required to purchase a single article has made the idea of reading technical papers on a regular basis cost-prohibited to many in science and engineering. In Part II I want to discuss an alternative referred to as "open access." To be considered "open access" the Budapest Open Access Initiative (BOAI) http://www.soros.org/openaccess/ states the users must be able to "read, download, copy, distribute, print, search, or link to the full texts of these articles." The upside for the reader is the cost is free. The downside for the publisher is a profit incentive has been removed. Much of the work done by the publisher 30 years ago (layout, graphics, equations, etc.) is now being done by the authors and the personal computer. As a result, the need for a traditional publisher is vanishing.

Publishers are not without value. They take documents written in a text editor (e.g., MS Word, etc.) and convert them to structured documents with generic markup. The advantage is that these structured documents can be folded into the preferred format today (e.g. PDF) but will also be ready for the preferred format in the future, whatever that will be some 10, 20, 30 etc. years from now. Therefore, publishers do provide two important services: 1) they provide a central location for document storage and 2) they provide a format for long-term retrieval. Clearly, to take a long-term view, we should all learn to write structured documents. OUCH! I hate to learn new computer programs when I have barely mastered my present day programs. What I want is a text editor (like MS Word, etc.) that also converts everything to a structured document. Well, good news. They are being developed by the open access community; they are free, and they are getting really good. But I will save discussion of that topic for a later ESA Newsletter. For now, let me just stick to what I have found on the Internet that is going on today in open access.

The Daily Californian

http://www.dailycal.org/sharticle.php?id=13201

In the October 20, 2003 issue of the Daily Californian, Aron Ballard wrote an article titled "Berkeley Professor Challenges Publishing Status Quo." In that article Michael Eisen is mentioned for co-founding – along with Nobel laureate Harold Varmus and Stanford Professor Patrick Brown – the Public Library of Science (PLoS), an institute devoted to offering scientific journals free to anyone with an Internet connection. The catch is contributors must pay $1500 per article. Another downside mentioned is that a fundamental shift in academic culture is needed because, in order to earn tenure today, promising young professors need resumes referencing journals with brand-name recognition.

The PLoS *http://www.plos.org/journals/index.html*

PLoS publishes peer-reviewed, open access, scientific and medical journals (presently in the medical and biological fields) that include original research as well as timely feature articles. All PLoS articles are freely accessible online, are deposited in the free public archive PubMed Central, and can be redistributed and reused according to the terms of the Creative Commons Attribution License (CCAL), where Creative Commons (CC) is a volunteer organization that has developed simple-to-understand licensing. PLoS founders have signed the BOAI, and BOAI founders have signed the PLoS.

The CCAL *ttp://creativecommons.org/about/licenses/comics1*

The CCAL allows you to place your work in one of six categories – from full copyright (all rights reserved) at one end to public domain (no rights reserved) at the other end. The four categories in between allow you to retain your copyright while granting others certain uses of your work. While some may want full copyright, most of us in the sciences understand that advancements

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Sources and Sinks (cont'd.)

A Crossroad in Technical Publishing - Part II: Open Access (cont'd.)

come from building off the published ideas of others; so, our papers should be in the public domain.

Effective 7/11/2006, Microsoft Office has a free download that allows insertion of a Creative Commons license into its Word, Excel and PowerPoint documents. The free download can be found at *http://www.microsoft.com/downloads/details.aspx?FamilyId=113B53DD-1CC0-4FBE-9E1D-B91D07C76504&displaylang=en*

The New Journal of Physics *http://www.njp.org*

There are some changes going on today. In Europe, the Institute of Physics (IoP) came up with a unique way (similar to PLoS) to have publications and to have them free to the general public. The New Journal of Physics is free to the reader. However, this year the author's cost of publishing an article in NJP is $1080. Fortunately, at select universities and institutes, the article charges are starting to be paid by their respective library departments. This solves the problem for those who work at larger institutions, but it leaves out potential publications from people who work at smaller institutions where money is scarce.

PhysNet *http://ccsd.cnrs.fr/PhysNet/journals.html*

PhysNet lists many free journals such as Atmospheric Chemistry and Physics (ACP), which can be found at: http://www.copernicus.org/EGU/acp/. However, in 2006, ACP started charging authors 23 (euros) per discussion paper page or about 70 per final page. This suggests that a lot of free journals may either need subsidies or page costs.

The Directory of Open Access Journals (DOAJ) http://www.doaj.org/

Like PhysNet, the DOAJ lists many free journals. The DOAJ defines open access journals as journals that use a funding model that does not charge readers or their institutions for access. For a journal to be included in DOAJ's "open access" directory, the journal must also "exercise peer-review or editorial quality control." Many of these new journals are located at university sites.

This has been just a cursory overview of "open access", an alternative way to publish your work without it becoming lost to all but the wealthiest of scientists and engineers. Perhaps it is time the ESA, and all those who deal in electrostatics, to consider establishing a peer-reviewed free-journal-of-electrostatics? I welcome others to contribute to an ESA Newsletter discussion (either for or against) such an idea.

For the Friendly Society
Al Seaver, 1995-1999 Past President of ESA

ESA OFFICERS

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Vice President	Sheryl Barringer, Ohio State Univ
Executive Council	John Gagliardi, Rutgers Univ.
	Steve Cooper, Mystic Tan
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CALENDAR

- Electrostatics 2007, 12th Int'l. Conf. on Electrostat., IoP, Mar. 25-29, 2007, St. Catherine's College, Oxford, UK, Contact: Jasmina Bolfek-Radovani, Tel: +44 (0)20 7470 4800, *jasmina.bolfek-radovani@iop.org* website: *http://conferences.iop.org/ELE/*
- 1st Int'l. Electrostatic Discharge Workshop, May 14-17, 2007, Stanford Sierra Conference Center, Lake Tahoe, California, Contact: ESD Assoc., Tel: 315-339-6937, *info@esda.org* , info at *http://www.esda.org*
- ESA 2007, June 12-14, 2007, Purdue University, West Lafayette, Indiana, Contact: Prof. Rajeswari Sundararajan, Tel: 765 494-6912, *raji@purdue.edu*
- 5th Asian Aerosol Conf., Aug. 26-29, 2007, Kaohsiung, Taiwan, info at *http://www.aac2007.org*
- 29th Annual EOS/ESD Symp., Sept. 16-21, 2007, Anaheim, California, Contact: ESD Assoc., Tel: 315-339-6937, *info@esda.org* or *http://www.esda.org* ,
- Elect. Insul. Conf., Sept. 24-26, 2007, Nashville, Tennessee, Contact: Mr. Art Lemm, Tel: 262-835-3368, Fax: 262-835-1515, *alemm@cooperpower.com* , info at *http://www.deis.nrc.ca/eic2007/eic2007.htm* (abstracts due Feb. 15, 2007)
- 16th Int'l. Conf. on Diel. Liquids, June 30-July 4, 2008, Poitiers, France, Contact: H. Romat, Tel: 33-(0)5-49-49-69-31, *icdl2008@lea.univ-poitiers.fr*, (abstracts due Oct. 15, 2008)

Journal of Electrostatics

Reminder: ESA is again offering a reduced price subscription to the Journal of Electrostatics. Our rate is over 85% off of the regular subscription price.

If you are interested in receiving the Journal in 2007 please let Steve Cooper know via e-mail at *steve@steve-cooper.com* or return the subscription form from the ESA website (*http://www.electrostatics.org*) by regular mail. The cost is $124 US. (Note that the normal subscription rate for non ESA members is over $1,000). You can pay for your subscription by check or through PayPal from the ESA website. If you received the Journal last year and wish to receive it again in 2007 please notify Steve to renew and avoid a disruption in your subscription.

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