

ESA Newsletter

Electrostatics Society of America - The Friendly Society

President's Message

First, I'd like to comment on what an honor it is to be nominated president of the ESA. I have great respect for those who have served before me and hope I can do justice to the position.

On behalf of the ESA membership, I'd like to thank Mark Horenstein on the commendable job he's done the last 4 years as ESA president. Not only did he step up for a second term, he put together the ESA website and continues to serve as the webmaster. Mark's relaxed, low-key nature hasn't kept us from recognizing the great job he's done overseeing and directing the organization. We know he'll be there for support and input in the future. We hope Mark is having a relaxing summer, though picking up the reins of editor for the Journal of Electrostatics should fill in some of his slack time. Thanks again for all your hard work Mark!!

The joint conference of the ESA and IEEE-EPC at University of Arkansas in Little Rock was a great success on all aspects. The technical sessions filled three full days along with two poster sessions covering a wide range of interest from a diverse group of international presenters. We compliment Mark Horenstein and Toshiaki Yamamoto for organizing these sessions. The facilities and arrangements at the university were very satisfactory as were the accommodations at the Peabody Hotel. Glen Schmiegl challenged our perceptions and entertained us at his almost traditional after-dinner presentation at the annual banquet. Malay Mazumder and his staff are to be commended for the seamless organization and support.

Several invited speakers provided interesting plenary lectures on electrostatics: 1) Gary Van Berkel

discussed the usage of electrospray ionization in mass spectroscopy (http://www.ornl.gov/csd/Research_areas/obms_rd.html), 2) Cheryl Lichti presented electrospray applications in proteomics, 3) Darrell Reneker shared progress in electrospinning and nano-fiber production (http://www.tx.ncsu.edu/jtatm/volume1specialissue/posters/posters_part1.pdf), and 4) Arun Bose reviewed advances in membranes for energy and fuel applications.

Markus Zahn's presentation at the James R. Melcher Memorial Lecture of "Electrohydrodynamics and Reflections on the work of Professor Melcher" was one of the highlights of the conference. Markus' combination of videos and lecture was very informative and entertaining. If you want to see the videos first hand, go to:

http://mit42v.mit.edu/lees/full/faculty/zahn/Publications/MelcherMemorialLecture/zahnpresentation/MelcherMemorialPresentationwithVideos_files/v3_document.htm

or go to:

<http://mit42v.mit.edu/lees/full/faculty/zahn/zahn00.html>

and click on "Melcher Memorial Lecture, IEEE/Electrostatics Society of America Meeting, June 25-27, 2003" near the top of the page. I've been informed the presentation is best viewed using Internet Explorer.

Jim Melcher's legacy is carried on in the work of several former students who are ESA members including Markus Zahn, Mark Horenstein, Joe Crowley, Tom Jones, Edmund Devitt, our editor Mark Zaretsky and possibly others that I am not aware of.

I hope everyone is having a good summer.

For the Friendly Society,

Bill Vosteen
ESA President

Current Events

Researchers Develop 'Natural Bandages' That Mimic Body's Healing Process

With the same compound the body uses to clot blood, scientists at Virginia Commonwealth University have created a nano-fiber mat that could eventually become a "natural bandage." Spun from strands of fibrinogen 1,000 times thinner than a human hair, the fabric could be placed on a wound and never taken off — minimizing blood loss and encouraging the natural healing process.

To make the fibers, the researchers used a technique called electrospinning. The process begins with a solution of fibrinogen attached to a nozzle, which is then pointed at a metal target. An electric field is created between the nozzle and the target, and it is gradually increased until the force of the electric field overcomes the surface tension of the solution. This forms a liquid jet that is transformed into a dry fiber before it reaches the target.

The solution is made with a high concentration that causes the polymer chains to intertwine. Instead of breaking into droplets just after the jet forms (which occurs in electrospray ionization — a similar technique that earned a Nobel Prize in chemistry last year for another VCU researcher, John Fenn), the jet continues as a continuous liquid stream. By the time it hits the target, the solvent has largely evaporated and fibers are formed.

excerpted from

<http://www.sciencedaily.com/releases/2003/02/030211072313.htm>

UC Riverside researchers' discovery of electrostatic spin challenges century-old theory

Anders Wistrom of UC Riverside's Department of Chemical and Environmental Engineering.

RIVERSIDE, Calif. -- In a discovery that is likely to impact fields as diverse as atomic physics, chemistry and nanotechnology, researchers have identified a new physical phenomenon, electrostatic rotation, that, in the absence of friction, leads to spin. Because the electric force is one of the fundamental forces of nature, this leap forward in understanding may help reveal how the smallest building blocks in nature react to form solids, liquids and gases that constitute the material world around us.

Scientists Anders Wistrom and Armik Khachatourian of University of California, Riverside first observed the electrostatic rotation in static experiments that consisted of three metal spheres suspended by thin metal wires, and published their observations in *Applied Physics Letters*. When a DC voltage was applied to the spheres they

began to rotate until the stiffness of the suspending wires prevented further rotation. The observed electrostatic rotation was not expected and could not be explained by available theory.

Wistrom and Khachatourian designed the study with concepts they had developed earlier.

"Experimental and theoretical work from our laboratory suggested that the cumulative effect of electric charges would be an asymmetric force if the charges sitting on the surface of spheres were asymmetrically distributed," said Wistrom. "In the experiments, we could control the charge distribution by controlling the relative position of the three spheres."

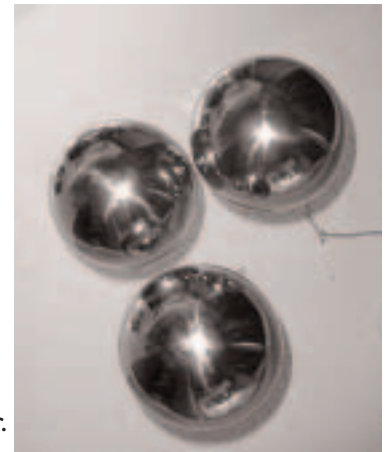
Since as early as 1854, when Thomson, later to become Lord Kelvin, theorized about an electric potential surrounding charged objects, scientists have concentrated on understanding how electric and magnetic phenomena are related. Indeed, the general applicability of Thomson's theory has not been tested experimentally or theoretically until now. In the *Journal of Mathematical Physics*, Wistrom and Khachatourian recently published insights that support the theoretical underpinnings for electrostatic rotation. "It is very satisfying to learn that electrostatic rotation can be predicted by the simple laws of voltage and force that date back at least 200 years," Wistrom said.

Spin is used in quantum mechanics to explain phenomena at the nuclear, atomic, and molecular domains for which there is no concrete physical picture. "So the discovery of electrostatic rotation and the identification of electrostatic spin as a natural phenomenon opens up an entirely new field of inquiry with the potential for significant advances," Wistrom said.

excerpted from

<http://www.newsroom.ucr.edu/cgi-bin/display.cgi?id=548>

(cont'd. on page 3)

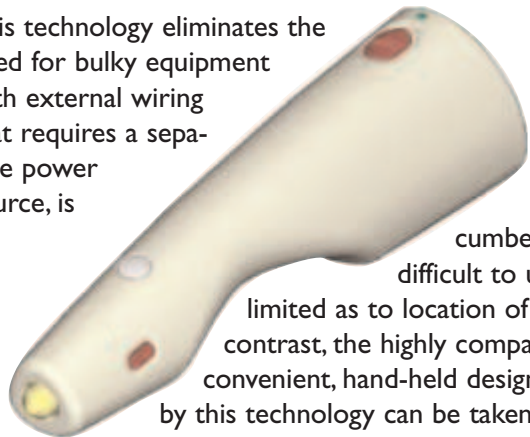


(cont'd. from page 2)

Electrostatic Spraying for Nasal & Oral Inhalation of Medications, Application of Foliage Treatments & Other Uses

An electrostatic spraying device which is designed to be portable, hand-held, self-contained and battery operated, with a disposable cartridge. The electrostatic spraying device is configured to provide a precise essentially constant flow rate of a product being applied, to provide uniformity and ease of application of the product, as well as to conserve product usage.

This technology eliminates the need for bulky equipment with external wiring that requires a separate power source, is



cumbersome and difficult to use, and is limited as to location of use. In contrast, the highly compact and convenient, hand-held designs offered by this technology can be taken virtually anywhere and used at any time without con-

cern for a power source or other requirements. The ability to deliver virtually constant product rates to a target area even at very low levels provides for highly cost effective application of expensive materials and materials that might be harmful to other nearby surfaces.

excerpted from <http://www.yet2.com/app/list/techpak?keyword=electrostatic+spraying+for+Nasal&args=1%25091%2509909706%2509%2509electrostatic%252Bspraying%252Bfor%252BNasal%2509%2509%2509-1&id=29653&qid=909706&sid=10&page=tpoverview>

Current Events Calendar

- ✦ 25th Annual EOS/ESD Symposium, Las Vegas, NV, Sept. 21-25, 2003, Contact: Christian C. Russ, email: cruss@sarnoff.com and <http://www.esda.org/news/call-for-papers2003.cfm>
- ✦ ESA 2004, June 22-25, 2004, Rochester, NY, Contact: Kelly Robinson, email: kelly.robinson@kodak.com
- ✦ Electrostatics 2005, June 15-17, 2005, Helsinki, Finland, Contact: electrostatics2005@congreszon.fi

Conference Report

Electrostatics 2003, Edinburgh, Scotland

The quadrennial meeting of the international electrostatics workshop, sponsored by the Institute of Physics (IoP) was held this past March in Edinburgh, Scotland. Actually, the meeting was held at the Heriot-Watt University (Watt as in James Watt), located about 6 miles west of Edinburgh. The public bus service worked well and I was able to get to downtown Edinburgh within 1/2 hr., taking advantage of my Saturday arrival to explore a little of the city. Just enough to decide that it's definitely worth a return visit for further exploration. The weather was unbelievably co-operative – sunny and relatively warm (no rain) for the whole visit (Sat. till Thurs.).

Sunday was spent at a tutorial given by John Chubb, Tom Jones, and Paul Holstock. The tutorial was full of many interesting demonstrations (including one on what to do when one forgets the key to a locked box containing important demonstration material), as well as useful information on electrostatic fundamentals and standards. Monday's sessions were on Hazards and MEMS & Applications. Keynote, or extended talks were given by Ulrich von Pidoll on electrostatic ignition hazard measurements (interesting insights into some techniques, along with some scary, and humorous, anecdotes) and Carol Livermore on a MEMS induction machine design (clear presentation on many of the key design issues). An excellent plenary talk was given by Tom Jones entitled "Electrostatics and the Lab-on-a-Chip", providing clever demonstrations of what Tom has dubbed "μplumbing", using dielectrophoretic forces to controllably move 10pL

volume drops along a surface. More information on his talk may be found at <http://www.ece.rochester.edu/users/jones/>.

Tuesday's sessions were on the topics of Biological and Measurements, with keynote talks by Masao Washizu on DNA manipulation using electrostatics (great video clips!) and Bill Greason on the wide variety of electrostatic measurement techniques (thorough and complete review). Wednesday's sessions were on EHD & Numerical Modelling and ESD, with keynotes by Antonio Castellanos on EHD in microelectrode structures (helpful for understanding the basic physics involved) and Jaakko Paasi on testing of ESD protective clothing (interesting adaptation of a charged plate analyzer). Thursday's session (AM only) was on the environment, with a keynote by Peter Castle on electrostatics and the environment (neat use of electrostatics for separation and recycling of plastics).

The ESA was well represented in presenters – aside from those mentioned above there were also talks or posters given or co-authored by Gerard Touchard, Istvan Berta, Dan Hays, Wamadeva Balachandran, Mark Horenstein, Carlos Calle, Ed Law, Steve Cooper, Sheryl Barringer, Chuck Noll, Matti Murtomaa, Kazimierz Adamiak, and myself. Apologies to anyone I may have overlooked. Given the uncertainty and concerns about the war that had just begun in Iraq, the conference was reasonably well attended by roughly 60 to 70 people, .

Mark Zaretsky

Electrostatic Profiles

I started this feature in the Jan./Feb. newsletter to serve as an alternative forum for introducing ESA members to each other, to share a bit of their work and personal environments, to whatever extent they are comfortable with, so as to help maintain and further expand the "Friendly Society". I'm pleased to present a profile of one of the new members of the Executive Council.

Sheryl Barringer

Like Mark Zaretsky (see Jan/Feb 2003 newsletter), I spent my youth reading science fiction stories. That led to playing Dungeons and Dragons (D&D), which my mother was convinced was a form of devil worship that leads to drugs and suicide. Instead, it led to rock climbing, which she doesn't think is much safer. Actually, my closest near-death experience was kayaking, not rock climbing, but there are some stories you just don't tell your mother. I now spend my weekends devising ways to bribe my daughter into going rock climbing or kayaking, but I've

given up D&D. (M&Ms are excellent bribes).

I chose to major in Food Science in college because everyone insisted I should major in Chemical Engineering, guaranteeing I wouldn't go near the field. However, my PhD work involved solving Maxwell's equations to predict microwave heating, so I ended up co-advised by a chemical engineer anyway. After being hired as a professor in Food Science at Ohio State, I turned my attention to tomato processing (Ohio is #2 in tomatoes in the US) until one day I was offered a coater and some money if I would agree to study electrostatic coating. After thinking it over long and hard (2 minutes), I agreed. Since then we've acquired two more coaters and proceeded to electrostatically cover potato chips, crackers, popcorn, cheese, tomatoes, sausage, chocolate and miles of alu-

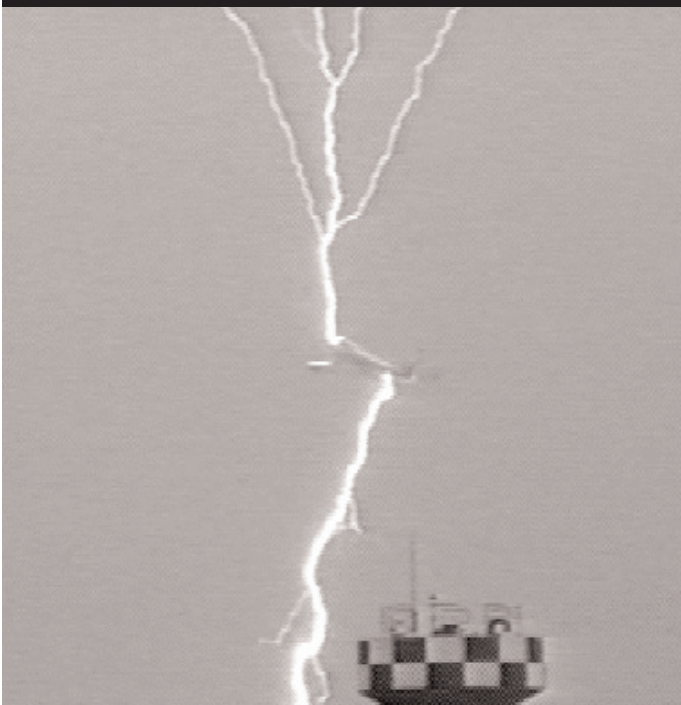
minum foil with every liquid and powder I can find. Last summer we popped enough popcorn to mulch the entire yard (imagine what 100s of pounds of molding popcorn smells like).

While everyone else seems to think electrostatics is about copiers, I know its true future is in painting food. Most of you have even eaten electrostatically coated food and don't know it. My favorite electrostatically coated food is Pringles. They figured out that they can add less flavor, but it is so evenly coated that people don't notice the difference. Bet you hadn't even noticed that the flavor is only applied to one side of the chip. So here's to more charge in your food, and hope to see you at the next meeting, where I'll be the technical program chair.



My daughter Sarah playing in the electrostatically coated popcorn

Yet More Current Events



Plane Being Affected by a Lightning Flash

The image shows an aircraft being affected by a lightning flash. To the authors knowledge, nobody on the plane was injured. It is unknown if the aircraft experienced any damage. According to the scientist who acquired this imagery, the airplane itself triggered the lightning discharge.

probe further at

http://www.crh.noaa.gov/pub/lgt/plane_japan.html

for more about lightning go to

<http://www.crh.noaa.gov/pub/lgt.shtml>

Society News

New Officers

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 year's conference a new slate of ESA Officers was elected for 2003-2005:

President: William Vosteen, Monroe Electronics
Vice President: Kelly Robinson, Eastman Kodak
Executive Council: Sheryl Barringer, Ohio State Univ.
John Gagliardi, Rutgers Univ.
Mark Zaretsky, Eastman Kodak

ESA subscription to J. of Electrostatics

ESA members are being offered a discounted rate of only \$105 for the year to the Journal of Electrostatics. Given the institutional price of over \$1,000 per year, this special rate represents a substantial savings. The member subscription is for individual use only. Detailed information about the readership, authors, aims, and scope of the journal can be found at <http://www.elsevier.nl/locate/elstat> .

Orders for member subscriptions will be processed by the ESA. Elsevier will mail your personal copy directly to the address that you specify. If you are interested, you can obtain a form either on-line (<http://www.electrostatics.org>) and pay on-line, or mail a hard copy of the form to our Secretary-Treasurer, Steve Cooper, 540 Morton Road, Athens, GA 30605 USA, with a check of \$105 made payable to the Electrostatics Society of America. Any questions please contact Steve by email essinc@negia.net or phone 706-769-0025 .

Membership Roster

In the past a new membership roster was issued in June. However, this is being changed so as to better coincide with the financial accounting cycle established by our treasurer. Therefore, the next membership roster will be issued in Feb., 2004, and will be issued yearly in this new time slot.

Email Addresses Requested

We would like to include member's current email addresses in our updated roster. Please send your current email address to me at mark.zaretsky@kodak.com . Also, please indicate if you would like to receive electronic notification of the newsletter (found on our website <http://www.electrostatics.org>) rather than a hard copy in the mail. Thank you for taking the time to send this information.

Note From the Editor

Apologies Again

This is the second time I've needed to apologize for delays in getting the newsletter to you. The June newsletter was issued by Mark Horenstein out of desperation. I feel very badly about having let everyone down once again. I will offer no excuses here. Instead, I will re-affirm my commitment to you and to the task. There will be two additional issues for the rest of the year, to be published on the first of October, and December. Final dates for submissions to the newsletter will be one week before the publication date. I hope people allow me another chance to do a proper job. Thank you in advance for your patience and generosity.

Shocking Sweets

Wintergreen Lifesavers and Triboluminescence

This may be old news to some but it was new and interesting to me. Triboluminescence means that upon rubbing or, in this case, chewing, charge separation occurs to such a high degree that an electrical discharge is created, emitting light, primarily in the UV portion of the spectrum. Sugar apparently is a triboluminescent material. What is noteworthy about Wintergreen Lifesavers is that its wintergreen flavor arises from methyl salicylate, a substance that has the fortuitous property of absorbing light in the UV and re-emitting (fluorescing) in the visible portion of the spectrum. This leads to a highly visible, bluish glow observed when crunching on the candy in darkened conditions. An interesting discussion of this topic, including photos taken of said Lifesavers being smashed with a hammer, may be found at <http://www.towson.edu/~sweeting/lwglcandywww.htm#SciAmer> .

SPACE AVAILABLE

This could be where your contribution to the next ESA newsletter appears. Please submit potential articles, perspectives (regarding electrostatic issues), and other relevant items to your newsletter editor at mark.zaretsky@kodak.com. Thank you.