Nov/Dec 2013 • No. 222

ESA Newsletter

Electrostatics Society of America - The Friendly Society

President's Message

Dear ESA Colleagues,

I hope you all enjoyed your holidays.

It's been a very cold couple of weeks here in Cleveland. A few days ago the temperature reached -12 °F, which I think was the coldest I've ever experienced. It was also very windy, and the wind-chill factor went down to -37 °F. The cold weather has me dreaming of summer… and with that, the 2014 ESA Annual Meeting.

The ESA Annual Meeting will be held June 17-19, 2014, at the University of Notre Dame in South Bend, Indiana. The meeting will be hosted by Prof. David Go, from the Department of Mechanical Engineering at Notre Dame. You will enjoy seeing Notre Dame's beautiful campus, and its famous sights such as "Touchdown Jesus".

Abstract submissions are now open, and the deadline is March 1. Abstracts should be submitted online at *http://www.electrostatics.org/conferences.html*. Prof. Poupak Mehrani, from the University of Ottawa, is the Technical Program Chair for the meeting. You can email Poupak at *poupak.mehrani@uottawa.ca* if you have questions about the abstracts or the technical program.

In addition to the usual technical sessions, the meeting will feature an electrostatics demonstrations session. We had such a session at the 2011 meeting, and it was a big hit. You will find it to be a great way to broaden your electrostatics understanding. Dr. Kelly Robinson is coordinating this session, and you can contact Kelly with questions (*Kelly.Robinson@electrostaticanswers.com*).

As usual, we hope to see a lot of students at the meeting. To facilitate student attendance, we keep the student registration fees very low, and we have an inexpensive dormitory housing option (but if you prefer a hotel we have hotel options as well). We will also hold our student paper competition, with cash prizes.

It is also a good time to start thinking about nominating a colleague for an ESA Award. The ESA Distinguished Service Award recognizes outstanding service to the ESA and the electrostatics community, the ESA Lifetime Achievement Award recognizes outstanding contributions to the field of electrostatics, and the ESA Honorary Life Member Award recognizes exceptional and sustained contributions to both the ESA and to the field of electrostatics. More complete descriptions of these awards, as well as the nominating instructions, are given at *http://electrostatics.org/esaawards1.html*. Nominations must be submitted by April 15.

I hope to see you at Notre Dame 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.

Calendar

- EIC 2014, June 8-11, 2014, Philadelphia, PA, USA, http://sites.ieee.org/eic/
- ESA 2014, June 17-19, 2014, Univ. of Notre Dame, South Bend, Indiana, USA, David Go, *dgo@nd.edu*
- SFE 2014 (9th Conf.) Aug. 27-29, 2014, Toulouse, France, *secretariat-sfe2014@laplace.univ-tlse.fr* (abstract due Jan. 31, 2014)
- 2014 EOS/ESD Symposium Sep. 7-12, 2014, Tuscon, AZ, USA, http://www.esda.org/symposia.html, Contact: *info@esda.org*
- IEEE/IAS Annual Mtg. Oct. 5-9, 2014, Vancouver, BC, Canada, http://www.ewh.ieee.org/soc/ias/2014/ Contact: Rajesh Sharma, *rsharma@astate.edu* (draft manuscript due Mar. 1, 2014)
- ESA 2015, June, 2015, Cal Poly Pomona, Pomona, CA, USA, Keith Forward, *kmforward@csupomona.edu*

ESA2014: Electrostatics Demos

At the upcoming ESA Meeting set for June 17-19, 2014 at the University of Notre Dame in Notre Dame, Indiana, we will have a special evening workshop and reception devoted to electrostatics demonstrations. The goal is to provide a variety of demonstrations from educational experiments to safety and consultation topics, building upon the very successful demonstration workshop at the 2012 ESA/IEJ/IAS/SFE joint meeting at the University of Waterloo. The event is slated to take place on the campus of University of Notre Dame, adjacent to where the conference talks will be held and close to all the lodging options. We are currently looking for volunteers to run their own demonstration. If you have a favorite demonstration to share or have an idea for a new one, this is the event for you.

If you need to borrow equipment for your demonstration (fieldmeter, electrostatic voltmeter, Van de Graaff generator, electrophorus, … whatever you need) or if you have any questions about our session, please contact Kelly Robinson, who is coordinating the workshop.

Kelly Robinson, PE, PhD
Owner, Electrostatic Answers
kelly.robinson@electrostaticanswers.com

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. Shesha Jayaram at *shesha.jayaram@uwaterloo.ca*, 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.

2014 Annual Meeting of the Electrostatics Society of America

University of Notre Dame, Notre Dame, IN

June 17-19, 2014

The Electrostatic Society of America (ESA) invites papers in all scientific and technical areas involving electrostatics for the 2014 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 confirmed an excellent slate of keynote speakers:

- **Dr. Giles Harrison**, University of Reading, UK
- **Dr. Sung-Jin Park**, University of Illinois Urbana-Champaign and Eden Park Illumination, USA
- **Dr. Hak-Kim Chan,** University of Sydney, Australia
- **Dr. Junhong Chen**, University of Wisconsin-Milwaukee, USA
- **Dr. Peter Ireland**, University of Newcastle, Australia

Special Events

Electrostatics Demonstration Workshop and Reception, and the Annual ESA Banquet.

Student Presentation Competition

Presentations by undergraduate and graduate students are eligible for the Student Presentation Competition. Please indicate student presenter when submitting abstract.

Important Dates

January 1, 2014	*Abstract submission open*
March 1, 2014	*Abstract submission deadline*
March 15, 2014	*Notification of abstract acceptance*
May 10, 2014	*Early registration deadline*
May 15, 2014	*Final manuscript deadline*

Abstract Submission & Conference Travel Information

http://www.electrostatics.org

Contact Information

General Chair

Prof. David B. Go (dgo@nd.edu)
University of Notre Dame, USA

Technical Chair

Prof. Poupak Mehrani (poupak.mehrani@uottawa.ca)
University of Ottawa, Canada

CALL FOR PAPERS

The **IEEE/IAS Annual Meeting, Vancouver, BC, Canada, October 5-9, 2014,** will address the technical interests related to industrial applications of electrical energy.

The **Electrostatic Processes Committee** will sponsor technical sessions on topics including but not restricted to the following:

Electrostatic Phenomena - Coronas and gas discharges; gas and liquid breakdown; dielectrophoresis; electric fields and biological cells; charged particle physics; electrohydrodynamics; electrofluidization; ESD/EOS; corona chemistry; computational electrostatics; nanoelectrostatics; electrostatic measurements.

Applied Electrostatics - Static elimination; electrostatic hazards; electrostatic spraying; electrostatic precipitation; electrophotography; electrostatic transducers, motors and sensors; electrostatics in polymer processing; gas discharge chemical reactors; electrostatic coating; electrostatic separation; and high-voltage power supplies.

Draft manuscripts should be sent to: Technical Committee Program Chair:
Prof. Rajesh Sharma, Arkansas State university PO Box 1080, State University, AR72467 USA,
tel: 870.972.2270, email: **rsharma@astate.edu**
Note: Proposals for Tutorials (which can range from 4 hours to 8 hours) should include a detailed outline as well as a list of presenters and their credentials.

Authors' Deadlines

March 1, 2014: Draft manuscript of the proposed papers from authors received by the Technical Committee Program Chair.

May 1, 2014: Notification to authors of acceptance or rejection from Technical Committee Program Chair.

June 1, 2014: Authors will receive via e-mail their paper number(s) and paper uploading instructions.

July 1, 2014: Deadline for submission of final conference manuscripts to. It should be noted that this is a firm deadline and that the processing of late papers will not be possible.

Draft manuscript requirements:

Draft manuscript should be similar to the final conference manuscripts. The authors would still be allowed to make changes when they make final submissions. Manuscripts should include paper title, names of all authors, area of interest, and name and address of the corresponding author, including phone, fax, and e-mail address (e-mail address required). Electronic submissions only with be accepted, either as Adobe acrobat (pdf) or Microsoft Word files.

Each paper that is scheduled for presentation must be accompanied by a qualified paid registration. Student registrations are not considered qualified registrations. A paper which is not presented in person by one of the authors or a designated alternate will not be included in the IEEE Xplore record of the Conference. Presented papers are eligible for review and publication in the **IEEE Transactions on Industry Applications or IEEE Industry Applications Magazine**.

Current Events

Mysterious 'Ball Lightning' Recreated In The Lab

Robert Ferris

Researchers at the U.S. Air Force Academy have created a ball-shaped flash of plasma that closely resembles the near-mythical "ball lightning" reported for millennia. It's estimated that only one in a million lightning strikes produces the ball lightning phenomenon, which makes it impossible to study in nature. Though it's rare, ball lighting is so stunning that there are more than 10,000 written accounts of the bright, spherical lights in the sky which linger for seconds longer that a true lightning bolt. A glowing orb of ball lightning was even rumored to be what killed 18th Century scientist Georg Wilhelm Richmann. The glowing balls can range from a fraction of a centimeter to more than a foot in diameter. They are often misidentified as UFOs.

Nikola Tesla was the first person known to have recreated a ball lightning-like charge in the lab, in 1904. In the hundred years since then, only a few researchers have successfully repeated Tesla's accomplishment.

Producing ball lighting in the lab not only disproves UFO claims, but allows scientists to study its properties and get a better understanding of the conditions inside thunderstorms that produce it.

Russian scientists successfully made plasma balls in the lab in 2002 — catching the attention of Mike Lindsay, then a student at the U.S. Air Force Academy, who wondered if he could recreate and study the phenomenon. "When I heard about these plasmas that were being created in Russia, that looked like ball plasma, a plasma that could live without a power source for seconds, that struck me as exciting," Lindsay told Business Insider.

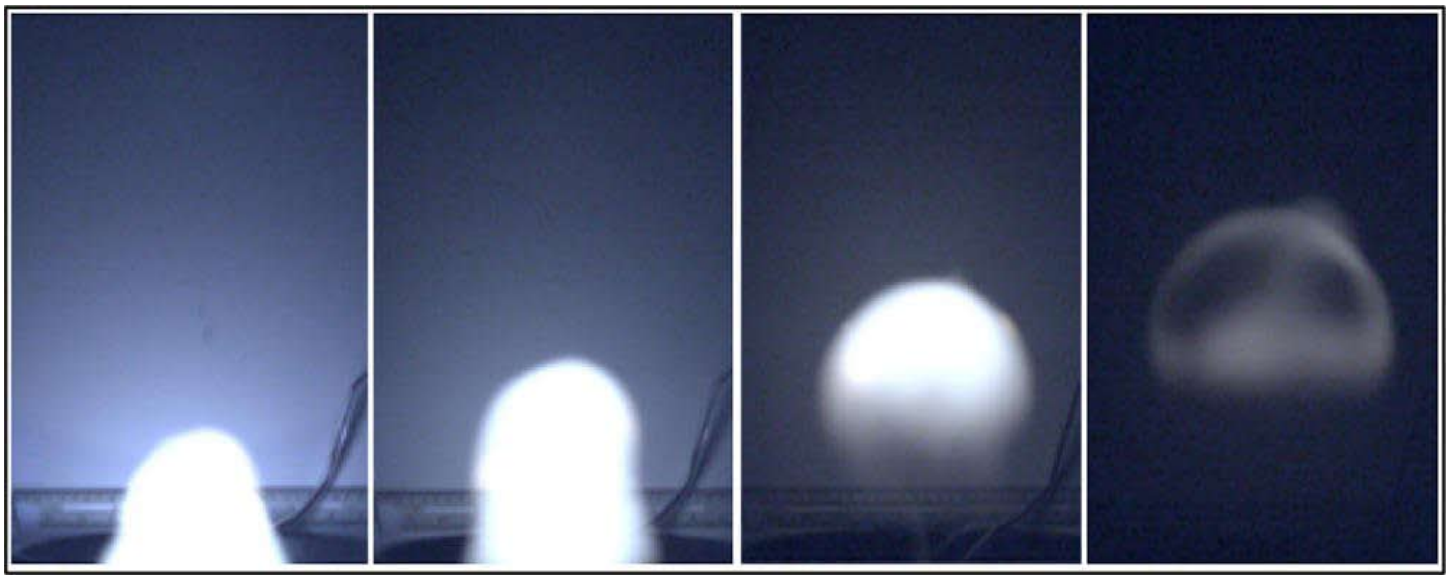
Lindsay's team has recreated the previous experiments, while managing to extend the life of the ball by making adjustments to the mechanisms that create it. To recreate the previous experiments, Lindsay and his research team filled a bucket with a salt solution, and then ran a long, tube-like electrode vertically from the bottom of the bucket to just above the surface.

Then they ran a strong electrical charge through the metal rod. The reaction of the electrical charge above the electrolyte solution created an arc that then floated above the surface and took on a ball-like shape — the plasma balls seen in these photos (see below). "We even tried it with Gatorade," Lindsay said. "It works."

By adjusting both the acidity of the electrolyte solution and the voltage in the electrical charge, Lindsay's team has managed to get the ball to last longer than it ever has in previous experiments. They were even able to video tape it. Lindsay published his results in the June 14 issue of the Journal of Physical Chemistry.

Their findings suggest that a bolt of lightning is actually a channel of plasma that conducts an electrical charge for an instant — a second at most. They found that what makes ball lightning different is that the plasma can linger for several seconds, rather than instantly disappearing back into the atmosphere. The scientists can now reliably produce this phenomenon in the lab, letting them study it in greater detail than ever before.

(from *http://www.businessinsider.com/mysterious-ball-lightning-made-in-lab-2013-8*)



A frame-by-frame photo of the image *C. Michael Lindsay, et al.*

Current Events (cont'd.)

Electrohydrodynamic effect offers promise for efficient propulsion in air

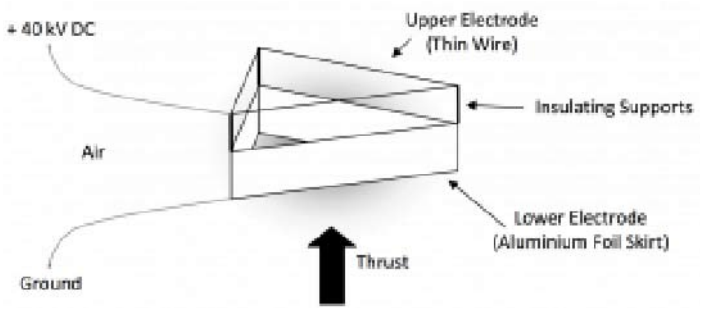
Jennifer Chu, MIT News Office

When a current passes between two electrodes — one thinner than the other — it creates a wind in the air between. If enough voltage is applied, the resulting wind can produce a thrust without the help of motors or fuel. This phenomenon, called electrohydrodynamic thrust — or, more colloquially, "ionic wind" — was first identified in the early 20th century. Since then, ionic wind has largely been limited to science-fair projects and basement experiments; hobbyists have posted hundreds of how-to videos on building "ionocrafts" — lightweight vehicles made of balsa wood, aluminum foil and wire — that lift off and hover with increased voltage.

Despite this wealth of hobbyist information, there have been few rigorous studies of ionic wind as a viable propulsion system. Some researchers have theorized that ionic thrusters, if used as jet propulsion, would be extremely inefficient, requiring massive amounts of electricity to produce enough thrust to propel a vehicle. Now researchers at MIT have run their own experiments and found that ionic thrusters may be a far more efficient source of propulsion than conventional jet engines. In their experiments, they found that ionic wind produces 110 newtons of thrust per kilowatt, compared with a jet engine's 2 newtons per kilowatt. The team has published its results in the Proceedings of the Royal Society.

Steven Barrett, an assistant professor of aeronautics and astronautics at MIT, envisions that ionic wind may be used as a propulsion system for small, lightweight aircraft. In addition to their relatively high efficiency, ionic thrusters are silent, and invisible in infrared, as they give off no heat — ideal traits, he says, for a surveillance vehicle.

A basic ionic thruster consists of three parts: a very thin copper electrode, called an emitter; a thicker tube of aluminum, known as a collector; and the air gap in between. A lightweight frame typically supports the wires, which connect to an electrical power source. As voltage is applied, the field gradient strips away electrons from nearby air molecules. These newly ionized molecules are strongly repelled by the corona wire, and strongly attracted to the collector. As this cloud of ions moves toward the collector, it collides with surrounding neutral air molecules, pushing them along and creating a wind, or thrust.



To measure an ion thruster's efficiency, Barrett and Masuyama built a similarly simple setup, and hung the contraption under a suspended digital scale. They applied tens of thousands of volts, creating enough current draw to power an incandescent light bulb. They altered the distance between the electrodes, and recorded the thrust as the device lifted off the ground. Barrett says that the device was most efficient at producing lower thrust — a desirable, albeit counterintuitive, result. "It's kind of surprising, but if you have a high-velocity jet, you leave in your wake a load of wasted kinetic energy," Barrett explains. "So you want as low-velocity a jet as you can, while still producing enough thrust." He adds that an ionic wind is a good way to produce a low-velocity jet over a large area.

Barrett acknowledges that there is one big obstacle to ionic wind propulsion: thrust density, or the amount of thrust produced per given area. Ionic thrusters depend on the wind produced between electrodes; the larger the space between electrodes, the stronger the thrust produced. That means lifting a small aircraft and its electrical power supply would require a very large air gap. Barrett envisions that electrodynamic thrusters for aircraft — if they worked — would encompass the entire vehicle.

Another drawback is the voltage needed to get a vehicle off the ground: Small, lightweight balsa models require several kilovolts. Barrett estimates a small craft, with onboard instrumentation and a power supply, would need hundreds or thousands of kilovolts. "The voltages could get enormous," Barrett says. "But I think that's a challenge that's probably solvable." For example, he says power might be supplied by lightweight solar panels or fuel cells. Barrett says ionic thrusters might also prove useful in quieter cooling systems for laptops. Ned Allen, chief scientist and senior fellow at Lockheed Martin Corp., says that while ionic thrusters face serious drawbacks — particularly for aerospace applications — the technology "offers nearly miraculous potential." "[Electrohydrodynamic thrust] is capable of a much higher efficiency than any combustion reaction device, such as a rocket or jet thrust-production device," Allen says. Partly for this reason, Allen says Lockheed Martin is looking into the technology as a potential means of propulsion.

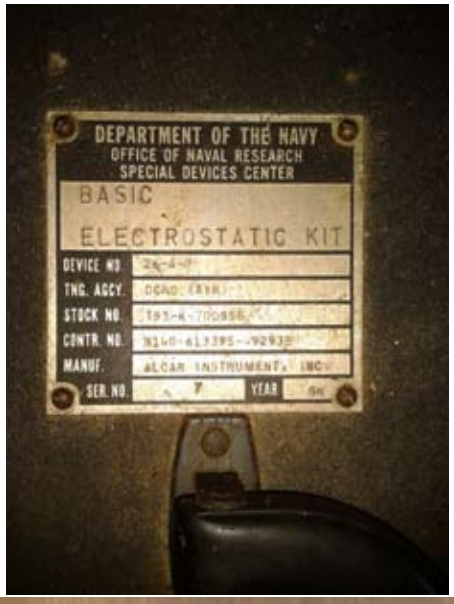
"Efficiency is probably the number one thing overall that drives aircraft design," Barrett says. "[Ionic thrusters] are viable insofar as they are efficient. There are still unanswered questions, but because they seem so efficient, it's definitely worth investigating further."

(from http://lae.mit.edu/?p=2450)

Does Anyone Know...?

We have a request from a reader, Darryl Pecquet, regarding a 1954 Navy Electrostatic Kit that he ran across at a garage sale. Pictures of the kit are provided below. He is hoping to find out more information about its use and if it is of any value. Web searches have not come up with anything meaningful. If you have any thoughts on this kit please contact Darryl at *dpecquet@us.ibm.com*

(Editor's note: it seems to me that some of the items are for electrostatic demonstration purposes. For example, the item on the bottom left having 3 spokes looks like something one might use to demonstrate corona wind by freely mounting on it's centerpoint and raising to high voltage)



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