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ESA Newsletter

Electrostatics Society of America - The Friendly Society

President's Message

Leadership & ESA

Dear ESA Members:

I wish you a very happy, healthy, productive and wonderful 2011!

This is my 3rd year as your dear president for our friendly society and we will have our next president after the 2011 ESA Annual Meeting. I enjoyed immensely my tenure as ESA President and I am greatly indebted to all of you for your great support, encouragement and help whenever needed, making my tenure as enjoyable as it could be. I am very grateful for this opportunity to serve the ESA and look forward to continuing to serve in as many ways as possible in the future. In this newsletter you will find the slate of officers for your approval (p. 2). This spurred the topic of my discussion about leadership, motivation, dreams and success etc. in work and in life, topics of personal interest too. Reflecting on leadership, one of the most successful leaders I would like to talk about is Mr. John Wooden [Wooden on Leadership], yes, the same UCLA basketball coach who won 10 NCAA championships in 12 years, had an 88 game winning streak and 4 perfect seasons, unparalleled so far. The main reason I like his philosophy, aside from the fact that it just makes sense, lies in the fact that he gives credit to his father for all these achievements. This is something remarkable and, if you read articles by other successful people, you will find that he is not alone. Bill Gates mentions the same [Fortune, July 6, 2009]. Vince Lombardi Jr. wrote about his father's success (Vince Lombardi, 5 times NFL championship winning coach) in "What it takes to be Number One". The best selling author John Izzo dedicates his book, "The five secrets you must discover before you die", to his grandfather, whose ring he wears and whose legacy he carries on. And all these people have conveyed the same characteristics – to be successful in life, in sports, and in business.

If you read Wooden's popular Pyramid of Success, he talks about:

- Industriousness (there is no substitute for work)
- Friendship (requires a joint effort)
- Loyalty (to yourself and to all those depending upon you)
- Cooperation (be interested in finding the best way, not in having your own way)
- Enthusiasm (you must truly enjoy what you are doing)
- Self-control (you must practice self-discipline and keep emotions under control)
- Alertness (be observant and eager to learn and improve)
- Initiative (don't be afraid of failure, but learn from it)
- Inertness (being determined and persistent)
- Condition (mental-moral-physical: moderation must be practiced)
- Skill (a knowledge of and the ability to execute the fundamentals)
- Team Spirit (an eagerness to sacrifice personal interest for the welfare of all)
- Poise (just being yourself)
- Confidence (comes from being prepared and keeping proper perspective)
- Competitive greatness (be at your best when best is needed)
- Faith
- Patience
- SUCCESS

Vince Lombardi shares the same:

- Commitment
- Discipline Excellence
- Mental Toughness
- Habits
- Faith
- Passion
- Results
- Truth

The "best personal habits" is also mentioned in the popular Oprah Winfrey's shows [Time, Jan 10, 2011], and the five secrets relate to the above:

1. Be true to yourself
2. Leave no regrets
3. Become love
4. Live the moment
5. Give more than you take

(cont'd. p.2)

President's Message (cont'd.)

And this is what the cover page of "The Creative Executive" says, "How business leaders innovate by stimulating passion, intuition and creativity", and you and I know that this is not far from what our parents and grandparents told us when we were young.

And this is also true for our excellent ESA leaders –past presidents and others, they just did it, so others can follow it and so ESA becomes the world's best friendly society. So, let us all have a great life by giving our best in terms of work, life, help, role-model, etc. and let us also give some time and energy too to ESA – serving as energetic and enthusiastic volunteers at various levels, if it is not done already.

Many Thanks.

Have a great time.

Looking forward to see many of you at Case Western (I am sure you are all busy preparing your abstracts due March 1)

Yours for the friendly Society,

Raji Sundararajan,
ESA President

ESA OFFICERS

President:
Rajeswari Sundararajan, Purdue Univ.

Vice President:
Dan Lacks, Case Western Reserve Univ.

Executive Council
Sheryl Barringer, Ohio State Univ.
Steve Cooper, Mystic Tan, Inc.
Kelly Robinson, Electrostatic Answers, LLC

Calendar

- Electrostatics 2011, 13th Int'l. Conf. on Electrostatics, April 10-14, 2011, Bangor University, Wales, UK, Contact: Dawn Stewart, Tel: +44 (0)20 7470 4800, *dawn.stewart@iop.org*, website: http://www.electrostatics2011.org
- 12th Int'l. Conf. of Electrostatic Precipitation (ICESP XII), Maritim Hotel, Nuremberg, Germany, May 9-13, 2011, Contact: Norbert Grass, *norbert.gross@ohm-hochschule.de* website: *http://www.icespxi.org*
- ESA-2011, June 14-16, 2011, Case Western Univ., Cleveland, OH Contact: Dan Lacks, *daniel.lacks@case.edu,* website: http://www.electrostatics.org

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 2011-2013
President
Dan Lacks, Case Western Reserve Univ.
Vice President
Shesha Jayaram, Univ. of Waterloo
Executive Council
Sheryl Barringer, Ohio State Univ.
Steve Cooper, Mystic Tan, Inc.
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.

Rajeswari Sundararajan, ESA President
rsundara@purdue.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, 2008 and the new Council term of office begins on July 1, 2008. It is now time for the Secretary (address found on back page of this ESA Newsletter) to receive slates of nominees for the upcoming (7/1/1 - 6/30/13) 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, 2011. 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."

Electrostatics Society of America
2011 Annual Meeting

Case Western Reserve University • Cleveland, OH
June 14-16, 2011

The conference will cover a range of interdisciplinary topics related to electrostatics including fundamental physics and issues relevant to industry, atmospheric and space science, medicine, energy, and other fields.

Technical sessions include:

- **Atmospheric and space applications**
- **Biological and medical applications**
- **Breakdown and discharge**
- **Electrostatic forces and fields**
- **Electrostatics in flowing liquids**
- **Materials behavior and processing**
- **Measurement and instrumentation**
- **Particle control and charging**
- **Safety and hazards**

The conference will be held on the campus of Case Western Reserve University.



Conference Chairs:
Professor Daniel Lacks, Case Western Reserve University: daniel.lacks@case.edu
Professor R. Mohan Sankaran, Case Western Reserve University: mohan@case.edu

Deadline for abstracts is March 1, 2011.
Submit abstracts online at:
www.electrostatics.org/conferences.html

Current Events

Microsensors without microfabrication

Miniature motion sensors are everywhere these days, detecting the orientation of cell phones, deploying air bags in cars and measuring stresses in buildings and mechanical systems. But manufacturing the sensors' tiny moving parts requires the same high-tech, billion-dollar facilities that churn out computer chips.

Researchers at MIT's Center for Bits and Atoms (CBA) have now built a motion sensor that consists of a tiny metal bead suspended in what the center's director, Neil Gershenfeld, describes as "a hole drilled in a circuit board." A fluctuating electric field holds the bead aloft, in a tight orbit, and disturbances of the orbit indicate the sensor's direction of motion. Gershenfeld believes that the sensor opens the door to a new class of miniaturized devices that exploit the dynamics of simple physical systems instead of the mechanical interactions of precisely micromachined parts. Such "microdynamical" devices, Gershenfeld says, could enable cheaper, simpler, more responsive sensors for a range of applications, including the measurement of sound, pressure, fluid-flow and magnetic fields.

The CBA researchers' device can do the work of at least six different micromechanical sensors. It can measure linear motion in three dimensions, which would ordinarily require three accelerometers. But it can also gauge its orientation — whether it's tipped sideways or forward, or it's been rotated — which would usually require an additional three gyroscopes.

A six-dimensional sensor would make the motion detection of handheld devices much more precise. The Wii game controller, for instance, wouldn't need an infrared emitter mounted to the television, and the Apple iPhone would change its screen orientation more reliably. Rehmi Post, a visiting scientist at CBA who initiated the sensor project as a PhD student at MIT, points out that the three-axis accelerometer is the most expensive component of the Wii remote. He believes that ultimately, a six-dimensional microdynamical sensor could be manufactured for about a tenth as much.

In the most recent issue of the journal Applied Physics Letters, Gershenfeld, Post and George Popescu, who worked on the project as a graduate student, describe how they built their microdynamical sensor. At its heart is a particle trap, a device commonly used in experimental physics. Physically, the trap is very simple: two metal plates on either side of a circuit board, with a hole about the diameter of an electrical wire drilled through them. But a computer circuit hooked up to the plates exerts precise control over the electric field they produce.

The electric field, Gershenfeld explains, can be thought of as saddle-shaped: front to back, it curves upward at the ends, but side to side, it curves downward. The field fluctuates as if it were rotating, and a particle at its center is like a marble on a warped turntable. The marble starts to roll down one of the downward slopes, but the turntable revolves, and the marble finds itself rolling up an uphill slope instead. When it falls back down the slope, it repeats the whole process on the opposite side of the turntable, and so on.

A particle in the trap is thus not perfectly still but rapidly oscillating as, in effect, it rolls back and forth between upward slopes. Each of the six types of motion detected by a complete set of accelerometers and gyros disturbs the particle in a distinctive way.

(excerpted from MIT News, http://web.mit.edu/newsoffice/2010/accelerometer-0416.html)

New nanoscale electrical phenomenon discovered

At the scale of the very small, physics can get peculiar. A University of Michigan biomedical engineering professor has discovered a new instance of such a nanoscale phenomenon—one that could lead to faster, less expensive portable diagnostic devices and push back frontiers in building micro-mechanical and "lab on a chip" devices.

In our macroscale world, materials called conductors effectively transmit electricity and materials called insulators or dielectrics don't, unless they are jolted with an extremely high voltage. Under such "dielectric breakdown" circumstances, as when a bolt of lightening hits a rooftop, the dielectric (the rooftop in this example) suffers irreversible damage.

This isn't the case at the nanoscale, according to a new discovery by Alan Hunt, an associate professor in the Department of Biomedical Engineering. Hunt and his research team were able to get an electric current to pass non-destructively through a sliver of glass, which isn't usually a conductor. "This is a new, truly nanoscale physical phenomenon," Hunt said. "At larger scales, it doesn't work. You get extreme heating and damage. "What matters is how steep the voltage drop is across the distance of the dielectric. When you get down to the nanoscale and you make your dielectric exceedingly thin, you can achieve the breakdown with modest voltages that batteries can provide. You don't get the damage because you're at such a small scale that heat dissipates extraordinarily quickly."

These conducting nanoscale dielectric slivers are what Hunt calls liquid glass electrodes, fabricated at the U-M

Current Events (cont'd.)

Center for Ultrafast Optical Science with a femtosecond laser, which emits light pulses that are only quadrillionths of a second long.

The glass electrodes are ideal for use in lab-on-a-chip devices that integrate multiple laboratory functions onto one chip just millimeters or centimeters in size. The devices could lead to instant home tests for illnesses, food contaminants and toxic gases. But most of them need a power source to operate, and right now they rely on wires to route this power. It's often difficult for engineers to insert these wires into the tiny machines, Hunt said. "The design of microfluidic devices is constrained because of the power problem," Hunt said. "But we can machine electrodes right into the device."

Instead of using wires to route electricity, Hunt's team etches channels through which ionic fluid can transmit electricity. These channels, 10 thousand times thinner than the dot of this "i," physically dead-end at their intersections with the microfluidic or nanofluidic channels in which analysis is being conducted on the lab-on a-chip (this is important to avoid contamination). But the electricity in the ionic channels can zip through the thin glass dead-end without harming the device in the process.

This discovery is the result of an accident. Two channels in an experimental nanofluidic device didn't line up properly, Hunt said, but the researchers found that electricity did pass through the device.

(*excerpted from* [*http://ns.umich.edu/htdocs/releases/story.php?id=7709*](http://ns.umich.edu/htdocs/releases/story.php?id=7709))

Electric Ash found in Icelandic Volcano Plume

Researchers have determined that the ash plume that hovered over Scotland after the eruption of Eyjafjallajökull in April 2010 carried a significant and self-renewing electric charge. They argue that this adds a further dimension to understanding the detailed nature of volcanic plumes and their effects on air travel. The paper, published May 27, 2010, in IOP Publishing's Environmental Research Letters, is released as the UK continues to face the possibility of further flight disruption from future volcanic activity.

Shortly after the volcano's active eruption phase began in mid-April, the Met Office contacted Joseph Ulanowski from the Science and Technology Research Institute at the University of Hertfordshire, who together with Giles Harrison from the Department of Meteorology at the University of Reading, had developed a specialist weather balloon that could assess the location and composition of the volcanic ash clouds.

Book Review

Out of the Blue

John S. Friedman
Delta Trade, 2009, paperback 209 pages.

Reviewed by Glenn Schmeig

John Friedman has collected a large number of stories about lightning accidents and woven them together with bits and pieces of scientific lightning research. The result is a very good read, accurately described by his subtitle, "A History of Lightning: Science, Superstition, and Amazing Stories of Survival".

Those with a leaning toward science will find good details on modern lightning studies, including emergency room treatment of lightning injuries. Those wishing a more personal side will find exciting stories about lightning strikes and amazing helicopter rescues from mountaintops.

Give it as a birthday present to your favorite ESA member or a young student.

Current Events (cont'd.)

Their balloons, originally designed and used to study the properties of desert dust clouds, are able to assess not only the size of atmospheric particles but also the electric charge present. Measurements made last year with the balloons in Kuwait and off the west coast of Africa showed clearly that desert dust could become strongly electrified aloft. Charging modifies particle behavior, such as how effectively particles grow and are removed by rain.

A hastily scrambled team travelled to a site near Stranraer in Scotland where a balloon was launched, detecting a layer of volcanic ash 4km aloft, about 600m thick, with very abrupt upper and lower edges. From their measurements, the researchers conclude that neither energy from the volcanic source — more than 1200 kilometers away — nor weather conditions could have been responsible for the position of the charge found by the balloon.

The presence of charge deep inside the plume, rather than on its upper and lower edges, contradicts expectations from models assuming solely weather-induced charging of layer clouds.

Giles Harrison said, "Detailed volcanic plume properties, such as the particle size, concentration and charge found by our weather balloon are important in predicting the impact on aircraft."

[*http://www.scientificcomputing.com/news-DS-Electric-Ash-found-in-Icelandic-Volcano-Plume-052710.aspx*](http://www.scientificcomputing.com/news-DS-Electric-Ash-found-in-Icelandic-Volcano-Plume-052710.aspx)

Electrostatics
Society of America

30 Shalimar Drive
Rochester, NY 14618

ESA Information

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

Rajeswari Sundararajan
ECET-Dep't. Purdue Univ.
Knoy Hall of Tech.
401 N. Grant Street
West Lafayette, IN 47907
765-494-6912
rsundara@purdue.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

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