# The Current Source

Newsletter of the Schenectady Section of the IEEE


## Chairperson's Message

*By Peter Sutherland*

Thanks to all of the dedicated volunteers, the Schenectady Section has begun 2008 with an exciting and varied program of activities. Attending Section activities is an excellent way to learn about new developments in your field, and to broaden your outlook into what people are doing in other areas of electrical engineering. You can network, meet old or new friends, and have an enjoyable luncheon or tour. For IEEE members, there is usually no charge, and only a nominal charge for non-members, so bring your friends! Dues can support this only so long as the members show their support and attend our activities and volunteer their time to help out.

In addition to technical activities, we have career development programs, such as the recent presentation on how to develop soft skills to enhance your career. We have community volunteer activities, as in our ongoing participation in the Future City competition and the Schenectady Museum's Adventures in Science. The IEEE joins together with other local engineering societies in the Capital District Engineer's Week, which provide not only an opportunity to network, but to earn CEUs for Professional Engineering registration.

The Schenectady Section helps our members to apply for higher membership grades in the IEEE, such as Senior Member and Fellow, as discussed in articles in this newsletter. By providing opportunities for members to present the results of their work to a local forum, we provide valuable professional exposure and speaking experience. In addition, presentations from other meetings and conferences may be given at our membership meetings as long as the material is suitable for a wider audience. This helps to keep our members informed of new developments in all areas of the field. If you would like to give a talk, or to host a tour of your facility, please let us know!

In the past, most meetings for the Section have been held in the Schenectady area, with some in Niskayuna recently. However, we recognize that our membership spans a large area, and many members may not be able to attend due to location and scheduling constraints. We welcome proposals for meetings, whether noontime or evening, in other locations within our geographical area. It is also possible, with sufficient interest, to form subsections in other cities and towns.

One of the greatest opportunities that the IEEE offers is of active participation in professional activities. By working on committees, organizing meetings, chairing meetings, and a myriad of other tasks, our members gain valuable organizational experience and make many new professional contacts, which serve to greatly enhance their careers.

We are now looking for nominations for next year's officers. Take a look at the roster in this newsletter. There are tracks for the Section and the Power Engineering Society Chapter where a person starts as Secretary then becomes Treasurer and then Chair and finally Past Chair. Also there are many appointed posts for a wide variety of things, such as student activities and professional activities, newsletter editor and historian. Every year, new vacancies arise, which must be filled, and occasionally new posts are created. If you don't see what you like, there may be a need for a new post to be formed.

The technical societies of the IEEE are represented in the Section by chapters. Currently Schenectady has the Industry Applications, Power Engineering, Computer, Electron Device, Computational Intelligence, and Engineering in Medicine and Biology Societies represented. Your participation is welcome. Chapters of other societies can be formed if there is sufficient interest. All it requires is one or two leaders and enough local members to form a quorum.

Non-technical IEEE groups such as Women in Engineering, Life Members and Graduates of the Last Decade (GOLD) can form affinity groups within the section.

If writing is your thing, newsletter articles, not only describing Section events, but also related to Electrical Engineering in our geographical area are welcome.

Take a look through this newsletter, and you will be sure to see several things that you wish you had gone to, and several opportunities for new activities in which you want to participate. Take that step and get out and participate!

## Invest in your future

*The whole art of teaching is only the art of awakening the natural curiosity of young minds for the purpose of satisfying it afterwards. -* ***Anatole France*** *(1844 - 1924)*

There are several articles in this issue about efforts in this area to fill young minds with the joy of engineering. It is our hope that this both reminds you of the fun you had and stirs an urge to help out. Giving back takes so little time and offers such big rewards to these young minds.

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## What do you want to hear more about?

*If you have suggestions for speakers or topics that might be of interest to the members, please contact the Section Chair, Peter Sutherland, peter.sutherland@ieee.org or the Membership Chair, Lou Tomaino, l.tomaino@ieee.org*

## Call for Contributions

The Current Source is always open for contributions for future newsletters. There is certainly much more going on in this area then gets profiled in the newsletter. Do you have an article about a historical moment, a future event, or a notable discovery that might be of interest to the local IEEE community? How about a picture of some momentous occasion? Please contribute! Staff editors can even take your bulleted list and turn it into printable article if writing does not appeal to you. We do however have to reserve the right to refuse any material of a commercial nature.

*The Current Source* is published twice a year by the Schenectady Section of the IEEE. If you are interested in volunteering for *The Current Source* or wish to submit material for consideration, please contact the editor.

# Past, Present, Future: Alternating Current Electrification – Great Barrington Lights the Way, 1886

*We are so addicted to electricity, cheap and available and disturbance-free, that we are lethally vulnerable when natural or other disasters take that away from us. The debate now centers on the need for clean electricity generation. However, electricity itself was originally seen as one of the salvations of the environment. Prior to electrification, homes were heated and light by fire. The smoke contamination, especially in cities with a predominate usage of coal, was incredible. The London fogs, so thick you couldn't see your hand in front of your face, were a result of the density of smoke particulate matter in the air. Transportation was provided by animals, typically horses, with a resulting dung disposal problem that created what we today would call a health hazard. The electrification of cities solved both of these problems by providing a power source for heat, light, and transportation via streetcars. Stanley as an innovator, took the concept of electricity out of the key-and-kite parlor trick stage and changed all our lives for the better.*

*By Thomas J. Blalock*

On 20 March 1886 William Stanley provided alternating current electrification to offices and stores on Main Street in Great Barrington, Massachusetts. He thus demonstrated the first practical system for providing electrical illumination using alternating current with transformers to adjust voltage levels of the distribution system.

On March 20, 1886, William Stanley demonstrated the first practical system for providing electric illumination with the use of alternating current, and transformers to adjust the voltage levels of the distribution system.

This event took place on Main Street in Great Barrington, Massachusetts.

Stanley's technique in 1886 was virtually identical to the system used for the distribution of electric power today.

The alternating current system (using transformers) eventually replaced Thomas Edison's direct current system because of the ability to efficiently adjust voltage levels in different parts of the system so as to minimize the inherent power losses associated with distribution. This was not possible in the direct current system because transformers do not work on "D.C.".

A Siemens steam engine driven alternating current generator, located in "an old rubber mill" near Cottage Street in Great Barrington, provided the power for Stanley's pioneering distribution system. This power system was actually placed in operation on March 6, and the following two weeks were utilized for "research and development" before the public demonstration.

Stanley designed and built his own transformers for this installation. He demonstrated their ability to both raise and lower voltage by stepping up the 500-volt output of the Siemens generator to 3000-volts, lighting a string of thirty series-connected 100-volt incandescent lamps, and then stepping the voltage back down to 500-volts.

Wires were run from his "central" generating station along Main Street in Great Barrington, fastened to the elm trees which lined that thoroughfare. A total of six step-down transformers were located in the basements of some Main Street buildings to lower the distribution to 100-volts. A total of twenty business establishments were then lighted using incandescent lamps.

Stanley's demonstration of raising the generator voltage to 3000-volts and then back down again was exactly the same concept as employed in present day power systems where a " generator step-up" transformer is used to raise the system voltage to a very high level for long distance transmission, and then "large substation" transformers are used to lower the voltage to some intermediate level for local distribution. The transformers located in the basements of the buildings correspond, of course, to the transformers now used to step voltage down to the ultimate level for actual use by individual customers.

Therefore, Stanley's installation in Great Barrington was the first such system to include all of the basic features of large electric power systems as they still exist over one hundred years later.

**Features:**

Stanley's work at Great Barrington was built upon previous work by other investigators, notably the team of Gaulard and Gibbs in England (just as the work of Thomas Edison in regards to the development of the first practical incandescent lamp was built upon previous efforts by others).

Stanley, however, in designing transformers for use at Great Barrington, was the first to understand and appreciate three key features which allowed the alternating current transformer system of electric power distribution to be feasible:

(1) Gaulard and Gibbs had specified that their "transformer" devices were to be connected in series. Stanley recognized that such devices needed to be connected in parallel so as to prevent any changes in load on one such device from interfering with the operation of the remaining devices.

(2) Stanley was the first to understand sufficiently the behavior of the magnetic "circuit" (or core) of a transformer, and the need for this to be a closed circuit so as to allow for the regulation of the voltage produced in the secondary winding.

(3) Other investigators of that era were convinced of the futility of applying several hundred volts to a coil of wire (the primary winding of the transformer) having a resistance of less than one ohm. Stanley, on the other hand, was able to comprehend the concept of "counter electromotive force" which is the means by which current flow is limited in the transformer primary.

Thus, at Great Barrington, William Stanley first applied all of the essential theoretical concepts necessary for the use of transformers in the practical distribution of alternating current electric power.

# Society of Women Engineers at Union College

*By Christine Farrell, Selin Whitham, and Malysa Cheng*

The Union College chapter of the Society of Women Engineers (SWE) held their 2nd annual networking dinner on Monday, April 28th to connect the College's female engineers with professors and professionals in their field.

The Union Chapter of the Society of Women Engineers aims to promote and educate its members though increased exposure at the local and national levels or through providing networking opportunities with alumni and SWE members nationwide.

As SWE chapter President Selin Whitham ('09) states, "We have tried very hard to accomplish these objectives and our annual networking dinner is a way for us to show our achievements and ultimately hit all of our goals, meaning we are advancing our chapter, we are promoting ourselves and learning by getting mentors from companies, we are networking with alumni and employers around the area, and the are trying to strengthen the community."

Attendance brought Hale House to capacity with 80 guests, almost three times as many attendees as last year. Many professionals were present at the dinner and the Union students were scattered around at each table to make sure there would be conversation between students and professionals.

One visiting professional, Eletta Kershaw, mother of current Union student George Kershaw ('10), stated that "the SWE Professional's Dinner provided an excellent opportunity for industry partners to engage with the SWE students, faculty, and administration. Quite impressively, the women of SWE demonstrated professionalism and highlighted incredible accomplishments in their conversations and formal presentations. As the SWE Advisor, IBM recruiter, and Union parent, I felt great pride and satisfaction!"

Employees of several companies including IBM, Lockheed Martin, Siemens, and General Electric attended the event, and, explains Whitham, "several Union students presented their recent work to show employers, parents, and alumni what engineering is all about here at Union." In addition to professionals, Union faculty members, Career Center Director Bob Soules, and current engineering students from Union and RPI were in attendance.

Dean of Engineering, Cherrice Traver, commented on the dinner, saying, "It was exciting to see the large number of young women engineers from several companies at the dinner. This was a great effort by SWE to reach out to the local engineering community."

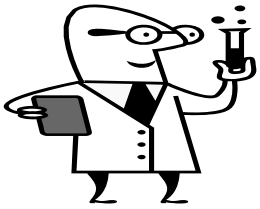
At the dinner, Selin Whitham and Christine Farrell ('09, VP of SWE) presented briefly about the goals of SWE as a national society and as a chapter at Union College, as well as past Union SWE events and the engineering program here at Union. Preceding this introduction, current Union female engineers presented on individual research projects. Wendy Beatty ('09) presented her project on the development of an undergraduate Engineering Design Textbook. Brittany Adam ('08) presented her senior project, Modeling and Optimizing the Pico OWC1 Wave Energy. Rebecca Damberg-Mauser ('08) presented her senior project, the Solar Rice Dryer, an *Engineers Without Borders* project. Laura Eyman ('08) presented her senior project, the Development of a Portable Hardness Tester for Biological Materials. Selin Whitham, Kaitlin Graham, and Michelle Rogers presented the project they have been collaborating on with Turkish students for their ongoing Virtual Term Abroad.

According to Whitham, students have been in contact with employers since the event to provide them with further information about their presentations, to explore potential job offerings, and to help set up future Union SWE events. This dinner was an overall success and the SWE members are looking forward to next year's dinner already!

*Contact Christine Farrell at farrellc@union.edu for more information on how you can help*

# Adventures in Science

schenectady MUSEUM & suits-bueche PLANETARIUM



## WANTED

- Do you work on an interesting project that you'd like to share?
- Do you enjoy sharing your interest in science?
- Want to encourage young people to explore or learn to experiment with science?

If you answered "YES" to any of these questions…we want you!

The Schenectady Museum & Suits-Bueche Planetarium is launching a new program, Adventures In Science. This program features local scientists or educators who will present their own demonstration or unique hands-on activity for museum visitors, especially targeted to children ages 6 – 12.

Volunteers from companies and organizations like the Dudley Observatory, the College of Nanoscale Science and Engineering, SI Group and General Electric have shown a variety of programs and experiments, including the following:

- Demonstrating magnetic materials and their properties as well as the relationship between magnetism and conductivity
- Making resin worms
- Using devices to detect wood, metal and organic materials hidden within a box
- Using dry ice to inflate a balloon
- Freezing marshmallows with liquid nitrogen
- Shining pennies with a salt and vinegar solution
- Conducting electricity through a salt solution
- Pictures of dust mites and other things that scientists can see at the nanoscale

Adventures In Science happens between 1pm and 3pm on the fourth Saturday of each month (except December).

For more information, contact:
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518-382-7890 x 252
jgish@SchenectadyMuseum.org
15 Nott Terrace Heights
Schenectady, New York 12308
www.SchenectadyMuseum.org

Bring yourself
Bring your kids

# 2008 ENGINEER'S WEEK

*By Ralph DeSorbo, PE*

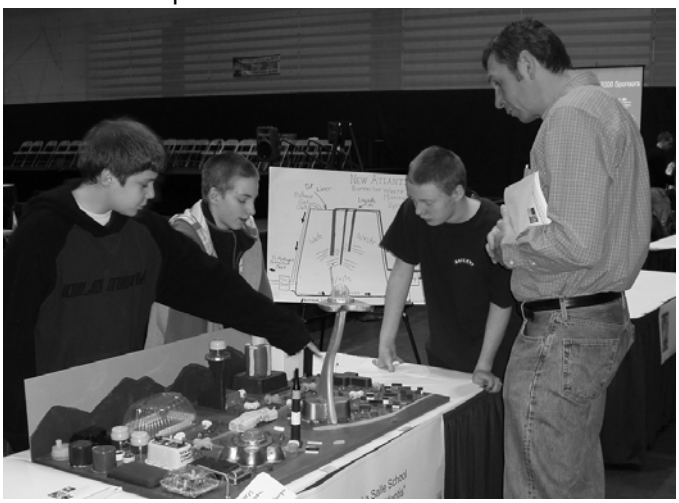
This year's Engineer's Week event, held on February 14th and 15th was so popular that the facility it was held in, the Albany Marriott Hotel was overcrowded! Serious thought has been given to holding future Engineer's Week events at a facility that has greater capacity. A total of 80 different presentations were given, not including the model bridge building competition or the lunchtime program. Some of the IEEE presenters were Jason Buneo and Louie Powell. Five presentations were given on the following electrical topics; *"High Voltage DC Transmission: A "New" Old Idea"* was presented by Ron Hauth, P.E. *"Electrical Arc Flash Hazards Systems Application Considerations"* was presented by Jason Buneo, *"Voltage Quality Fundamentals for Sensitive Industrial Loads"* and "*Designing for Reliability"* were presented by Louie Powell. P.E. *and "Structure Data Cabling System Installation Considerations"* was presented by Edward Coye. Some participants earned as many as 10 PDH certificates which were approved by the NYS Professional Engineer's Board for triennial credit. Seminar only attendance for the two days cost only $110.00. Such a bargain at only $11 for each PDH!

# Dreaming of the Future

*By Rebecca Nold*

What do a geo-stationary space station and an undersea colony have in common? They are both visions of the future proposed by city-planning teams at the Future Cities competition. On January 19, 2008 the Schenectady Section of the IEEE supported many students from 24 schools in a quest to make the future better by designing a "Future City".

Future Cities is a competition for 7th and 8th grade students. They begin by designing a city on Sim City software. Then they create a poster, write essays, build a table-top model out of recycled materials and finally, after four months of work, present their plan at a Capital District competition. There are scholarships, cash prizes, and the winning team gets to compete again in Washington D.C. during Engineer's Week in February.



*LaSalle school – winner of "Excellence in Generation and Conservation of Electrical Energy".*

The IEEE Schenectady Section sponsors the competition by providing funding to the organizers and awarding a $100 cash prize titled "Excellence in Generation and Conservation of Electrical Energy". One member, Peter Sutherland, volunteered as one of a number of judges for the overall competition. Three other members - Jovan Bebic, Einar Larsen, and Becky Nold, volunteered as judges for the IEEE section award.

The winner of the Schenectady Section award was La Salle School, for their diversity in power sources, including an interesting tidal pump. The La Salle Future City was named "New Atlantis". The overall winner was Farnsworth Middle School with a city named "Mohalla".

There are many ways to volunteer at this event. The best part about volunteering to represent the Section was getting to talk to the kids about their ideas. More information on the contest itself, volunteer opportunities, or how to get you school involved, check out the website.

(http://www.capitaldistrictfuturecity.org/)

# Past Section Events

Lunch events are held on average once per month. Most of you are receiving notices electronically for every event. If you are not, please update your profile on the IEEE website. Any questions on how to do this can be sent to the newsletter editor. Events are also advertised on the local Section website at http://www.ewh.ieee.org/r1/schenectady/events.html . Please check often! Reservations are required due to the cost of the lunch (as paid by the Section). All events are free for IEEE members who RSVP by the deadline, $10.00 for non-members and all who fail to RSVP by the deadline stated for each event.

| Date | Location | Title |
|---|---|---|
| October 3, 2008 | Niskayuna Reformed Church | IEEE Expert Now course - Cyber Security of Substation Control and Diagnostic Systems |
| May 29, 2008 | 5508 Bellinger Road, Cazenovia, NY 13035 | Tour of GE Energy Fenner Wind Park |
| April 25, 2008 | Brandon's | New York Power Markets |
| April 18, 2008 | Niskayuna Reformed Church | How to develop soft skills to enhance your career |
| March 7, 2008 | Union College | An overview of virtualization with a comparison of Solaris Containers with Windows VMware on ESX servers |
| February 29, 2008 | Niskayuna Reformed Church | HVDC Transmission; a revived interest in the US |
| February 14-15, 2008 | Albany Marriott | Engineers Week |
| January 25, 2008 | Niskayuna Reformed Church | Does the Path to Mars Lead through the Capital Region? |
| January 19, 2008 | Hudson Valley Community College | Future City Competition |

# Holiday Luncheon

The annual holiday luncheon is coming up at noon on Thursday, December 11th at the Niskayuna Reformed Church on Rt. 7 in Niskayuna. Join us for a good time and some great food. Contact any of the officers for more information.

# 69th Steinmetz Lecture - Enabling Musical Expression for Everyone

Music is one of the most powerful forms of human expression, and is increasingly recognized as a profound source of health and well-being far beyond its entertainment value. But music works its magic most fully through active engagement – rather than through the passive, background listening described in the "Mozart Effect" – and this requires new tools and environments that enable people of all ages, backgrounds and skill levels to participate. Hyperinstruments, initially invented at the MIT Media Lab to increase the performance virtuosity of great musicians from Yo-Yo Ma to Prince, have evolved into the Hyperscore composing software for kids as well as the smash hit video game Guitar Hero. Such technologies are now being further extended to give "voice" to seniors and the disabled, including specially designed "Personal Instruments" that adapt to anyone's individual skills and limitations. A recent performance using such an instrument will be shown, and a sneak preview will be given of an opera-in-progress that demonstrates the power of music for "personal identity archiving" in the physical and virtual worlds.

About the Speaker

Tod was called "America's Most Wired Composer" by *The Los Angeles Times* - is widely recognized as one of the most significant and innovative composers of his generation, and is also celebrated for inventing new technology for music. He studied with Elliott Carter at The Juilliard School, was the first Director of Musical Research at Pierre Boulez's IRCAM in Paris, and is currently Professor of Music and Media at the MIT Media Lab and also Visiting Professor of Composition at the Royal Academy of Music in London. Machover's music has been commissioned and performed by many of the world's most prominent soloists and ensembles, including Yo-Yo Ma, Joshua Bell, the Los Angeles Philharmonic, Houston Grand Opera, the BBC Symphony, the Boston Pops, the Ensemble InterContemporain, the Ying Quartet, and cellist Matt Haimovitz. He has been particularly noted for his large-scale interactive media projects such as the science ficton opera *VALIS*, the *Brain Opera*, and *Toy Symphony*, as well as for the design of creative music tools such as Hyperscore.

Tod's lecture was enjoyable for the engineer and non-engineer alike. He encouraged us to look at different methods of thinking, with pratical applications ranging from teaching children to appreciate music to helping returning combat vets to deal with the anguish of combat.

*More about the Steinmetz Lecture series: http://engineering.union.edu/SteinmetzMemorialLectures/*

*Dr. Cerrice Traver presents Tod Machover the Steinmetz medal*

## Did you miss the 69th Steinmetz Memorial Lecture?

Order a free DVD of the lecture by sending your name and address to:

Edison Exploratorium
PO Box 1417
Schenectady, NY 12301-1417
email: president@edisonexploratorium.org

# 2009 Officer Slate Now Online

It is that time of year again for new officers and volunteers. Please check out the nominations for officers for 2009 on the website at http://www.ewh.ieee.org/r1/schenectady/proposed_slate.html. We are seeking some additional volunteers for 2009. Job descriptions are also available on line at http://www.ewh.ieee.org/r1/schenectady/officer_descriptions.html.

- Newsletter Assistant
- Life Member Chapter Chair

We are also looking for volunteers to serve on a GOLD (Graduates of the Last Decade) committee and to participate with the Steinmetz Lecture organization committee. The commitment is minimal, only about 10 hours per year.

# Going Gold!

The Schenectady Section has formally reinstated the GOLD (graduates of the last decade) affinity group. This group serves as an outlet for young professionals in the pursuit of both technical and nontechnical networking opportunities as well as leadership roles. It is a great stepping stone to leading section-wide activities and events. For more information, please contact the GOLD chair, Mark McDonald, at markmcdonald@ieee.org.

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Date Sensitive Material