



IEEE Pittsburgh Section



# Bulletin

April 2008 Volume 57, No. 4



*Included in this issue:*

• <i>From the Chair</i>	2
• <i>Sensory-Motor Coordination: Basic Neuroscience and Neural Prosthetics</i>	3
• <i>The Importance Of Obtaining A PE License</i>	4
• <i>The FE Exam Review Course</i>	4
• <i>Radiation pressure and the linear and angular momenta of the electromagnetic field</i>	5
• <i>Biomechanics and Motor Control of the Hand</i>	7
• <i>Annual History Dinner - RSVP Now!</i>	8
• <i>Spintronic biochips for biomolecular recognition</i>	9
• <i>"Introduce a Girl to Engineering"</i>	10
• <i>Nanorobotics - Theory and Applications of Artificial Neural Networks</i>	10
• <i>Local Job Opportunity</i>	11
• <i>Westinghouse Documentary Released</i>	12
• <i>Power Quality Tutorial</i>	12
• <i>Career Survival for Engineers and Scientists in the 21st Century</i>	13
• <i>Raise Your Company's Profile</i>	13

Editor: Philip Cox, [p.e.cox@ieee.org](mailto:p.e.cox@ieee.org); Contributors: Jace Cochrane, Tom Dionise, Ganping Ju, Joe Kalasky, Guy Nicoletti, Andy Novotny, Kal Sen, Ralph Sprang, and Mao, Zhi-Hong.

*All announcements for publication in a particular month's bulletin are due to the Editor by the 20th of the previous month. The accuracy of the published material is not guaranteed. If there is any error, please bring it to the Editor's attention. The Section's web site [www.ewh.ieee.org/r2/pittsburgh](http://www.ewh.ieee.org/r2/pittsburgh) has past issues of the bulletin and lots of other useful information*

## • *From the Chair*

Greetings, friends. I trust you are all doing well.

I am pleased to report that the section met the early deadline for submission of reports for 2007, so we will receive a rebate bonus from IEEE headquarters. Thanks so much to everyone who worked so hard to hold meetings, file meeting reports, upgrade to Senior membership, and otherwise worked to increase our rebate. A special thanks to our 2007 treasurer, Harry Hagerty, and our 2008 treasurer, Joe Cioletti, for all their hard work on the L50 section financial report. Thanks also to our secretary, Bob Brooks, for tracking all of the L31 meeting reports.

Please read the announcement in this bulletin for the annual History Dinner. To ensure we have the right number of meals, we have set a deadline for payment for your dinner and will not be able to accept any reservations after that deadline. The talk promises to be an interesting discussion about a subject that is important to all of us as engineers. Please get your reservations in early so you do not miss out!

We could still use another volunteer or two for the social committee. Other committees and affinity groups could use your help as well. The Women in Engineering (WIE) affinity group is off to a good start, but would welcome your participation. You do not have to be female to participate, just interested in helping support women engineers and helping younger women learn more about engineering as a career. The local chapters of the Nanotechnology Society and the Lasers and Electro-Optics Society are also just starting up, so they could use some help also.

As always, I welcome comments, concerns, or feedback. Please let me know what is on your mind.

Ralph Sprang  
Pittsburgh Section Chair  
[rsprang@ieee.org](mailto:rsprang@ieee.org)

### Section

Chair & Awards Co-Chair – Ralph Sprang  
[rsprang@ieee.org](mailto:rsprang@ieee.org)

Vice Chair – John Twigg  
[itwigg@ascent-systems.com](mailto:itwigg@ascent-systems.com) (412) 795-4444

Secretary – Robert Brooks [rbrooks@medrad.com](mailto:rbrooks@medrad.com)  
(412) 767-2400 x3506

Treasurer – Joe Cioletti  
[joesph@cioletti.com](mailto:joesph@cioletti.com) (724) 516-3897

Webmaster – Gerry Kumnik, [gerrykum@ieee.org](mailto:gerrykum@ieee.org)

Immediate Past Chair – David J. Vaglia, P.E.  
[davevaglia@ieee.org](mailto:davevaglia@ieee.org) (412) 491-6944

UpperMon Subsection  
Chair: Dr. Dimitris Korakakis  
[Dimitris.Korakakis@mail.wvu.edu](mailto:Dimitris.Korakakis@mail.wvu.edu)  
(304) 293-0405 x2512

### Chapters

Communications Society - Chair: Phil Cox  
[p\\_e.cox@ieee.org](mailto:p_e.cox@ieee.org) (724) 443-0566

Computer Society – Chair: John Twigg (see above)

Engineering In Medicine & Biology Society  
Co-Chairs: Bob Brooks (see above), Dr. Zhi-Hong Mao  
[maozh@enr.pitt.edu](mailto:maozh@enr.pitt.edu) (412) 624-9674

Electromagnetic Compatibility Society  
Chair: Michael J. Oliver  
[emi@mair.com](mailto:emi@mair.com) (814) 763-3211

Power Engineering & Industry Applications Societies  
Chair: Andrew Novotny  
[andrewnovotny@ieee.org](mailto:andrewnovotny@ieee.org) (412) 351-4954

Magnetics Society – Chair: Dr. Ganping Ju  
[Ganping.Ju@Seagate.com](mailto:Ganping.Ju@Seagate.com) (412) 918-7046

Robotics Society – Chair: Dr. Guy Nicoletti  
[Nicolett+@pitt.edu](mailto:Nicolett+@pitt.edu) (724) 836-9922

Signal Processing Society – Chair: Dr. Heung-No Lee  
[hlee@enr.pitt.edu](mailto:hlee@enr.pitt.edu) (412) 624-9677

Society on Social Implications of Technology  
Chair: Joe Kalasky, P.E., [jkalasky@ieee.org](mailto:jkalasky@ieee.org) (724) 838-6492,  
Co-Chair: Andrew Rydholm, [andrew\\_rydholm@yahoo.com](mailto:andrew_rydholm@yahoo.com)  
(412) 261-3200 x281

### Affinity Groups

GOLD – Chair: Jason Harchick

Life Member – Chair: Bob Grimes, P.E.  
[r\\_d.grimes@ieee.org](mailto:r_d.grimes@ieee.org) (412) 963-9711

Women In Engineering – Chair: Jennifer Ploskina  
[jenniferLploskina@eaton.com](mailto:jenniferLploskina@eaton.com)

### Committees

Consultants Network

Professional/Career Activities (PACE)  
Chair: Joe Kalasky, P.E. (see above)

Student Activities – Rajiv Garg, [rajivg@computer.org](mailto:rajivg@computer.org)

Membership Development – Karl Muller,  
[karlmuller@compuserve.com](mailto:karlmuller@compuserve.com)

Publicity – Chair: Thomas Dionise, P.E.  
[ThomasJDionise@eaton.com](mailto:ThomasJDionise@eaton.com) (724) 779-5864

2008 PES General Meeting Technical Program Chair – Dr. Kalyan Sen (Kal) [senkk@ieee.org](mailto:senkk@ieee.org) (724) 696-1611; General Chair - Dave Vaglia (see above)

- ***Sensory-Motor Coordination: Basic Neuroscience and Neural Prosthetics***

**DATE:** Thursday, April 3, 2008

**TIME:** 5:50-6:00 pm—refreshments; 6:00-7:00 pm—seminar

**LOCATION:** 360 Benedum Hall, University of Pittsburgh, Pittsburgh, PA 15261 (a campus map is available at <http://www.tour.pitt.edu/tour-firstmap.html>)

**SPEAKER:** Prof. Aaron Batista, Ph.D. Department of Bioengineering, University of Pittsburgh

**SPONSOR:** Engineering in Medicine and Biology Society, Pittsburgh Chapter

**Abstract:** How does the brain generate movements from sensory inputs? Neuroscientists are gradually unraveling the intricate neural processes that perform this transformation. A new technology allows for high-volume neural recordings, which is accelerating the pace of research and enabling previously unavailable investigations of neural circuitry.

New knowledge about how the brain controls arm movements leads directly to improvements in neural prostheses. These devices hold promise as a treatment for paralysis by allowing movement intentions to be extracted directly from the cerebral cortex, to provide quadriplegics with control of external devices.

My laboratory at the University of Pittsburgh works at the interface between basic neuroscience and neural prosthetics. Results from our studies of sensory-motor coordination are applied to engineer improvements to neural prostheses. I will present recent work in which we observed unexpected interactions between sensory signals and motor commands, and demonstrated how we could leverage our knowledge of these effects to improve the performance of a neural prosthesis. I will also discuss our planned research to enhance the feedback loop by which the brain receives information about the performance of a prosthesis, potentially improving control.

**Bio:** Dr. Batista is an Assistant Professor in the Department of Bioengineering at the University of Pittsburgh. He received his B.A. (1994) in Philosophy, B.S.A. (1994) in Computer Science and Engineering, M.S.A. (1994) in Computer and Information Science, from the University of Pennsylvania, and Ph.D. (1999) in Computation and Neural Systems from the California Institute of Technology. Dr. Batista was a postdoctoral fellow in the Howard Hughes Medical Institute/Stanford University School of Medicine (1999-2003) and in the Department of Electrical Engineering of Stanford University (2003-2007), respectively. When studying at Caltech, he was a Sloan Fellow in Theoretical Neurobiology, and then as a postdoctoral fellow, he received a Career Award in Biomedical Sciences (2003-2008) from the Burroughs Wellcome Fund. His research has been published in a number of top journals including Nature and Science.

- ***The Importance Of Obtaining A PE License***

**Speaker:** Joseph M. DeSalvo, P.E.  
**Date:** Wednesday, April 2, 2008  
**Time:** Social 6:30 PM, Program 7:00 PM  
**Place:** Westinghouse Energy Center (see directions below)  
**RSVP:** Dr. Kal Sen, P.E., [senkk@ieee.org](mailto:senkk@ieee.org) or 724-696-1611 by March 27, 2008  
**Organizers:** Power Engineering Society/Industrial Applications Society.

**Abstract:** After receiving your degree in engineering, you started your career in Engineering. You and your family invested a lot of time and money and have made sacrifices to give you the opportunity to obtain your education and work experience. Common sense would tell you that it would be wise to purchase some insurance that would help protect the investment. The speaker will stress that taking the necessary steps to become a Licensed Professional Engineer is the insurance policy you need. Being a Professional Engineer, adhering to the Code Of Ethics and Rules of Professional Conduct, and making Continuing Professional Competency a part of your lifestyle will be the ingredients needed to protect your job and engineering career. In addition to the benefits of registration, the speaker will address the process for registration, the requirements, state laws, and the exams and how to prepare for them.



**About the speaker:** Joe DeSalvo is a Professional Engineer with degrees in electrical engineering (Pitt) and industrial management (Carnegie Mellon). He is a Senior Life Member of the IEEE and is presently on the adjunct faculty of Pennsylvania State University where he teaches FE (EIT) and P&P (PE) review courses and several engineering and economics courses in the Advanced Power Engineering Program. Mr. DeSalvo is retired from Allegheny Power, where, as Manager of Substation and Methods Standards, he had responsibility for substation designs and industrial engineering studies for three operating companies serving five states.

He has served the IEEE in over 60 positions at all levels during the last 40 years. He was the Chairman of Pittsburgh PES Chapter in 1975-76 when it received “Outstanding PES Chapter” award.” He is a past Chairman of Pittsburgh Section and a past Director of Region 2. He received the IEEE Centennial Metal Of Honor in 1984. In addition to IEEE activities, Mr. DeSalvo is a senior member of the Institute of Industrial Engineers and a member of Eta Kappa Nu and Sigma Tau honorary societies.

- ***The FE Exam Review Course***

As a service to our community, the Pittsburgh PES/IAS Chapter, in partnership with Penn State New Kensington, is sponsoring a 26-week FE Review Course starting in April 2008. Participants will be prepared to take the FE exam in October 2008. To become a PE, one must pass two exams: (1) Fundamentals of Engineering (FE) Exam, formerly referred to as the EIT Exam and (2) Principles and

Practice of Engineering (P&P) Exam, referred to as the PE Exam. Our local expert Joe M. DeSalvo, PE, who has been teaching Penn State Continuing Education classes for over 40 years, will teach this review course. Usually the charge for such a course is over \$1000 per person. Because PES/IAS will be responsible for the publicity and for providing the classroom facilities, we can project that the cost will be in the range of \$575 per person (IEEE member or non-member) or \$500 without books if we have at least 25 participants. Classes will be held Wednesday evenings beginning April 16 at the Westinghouse Energy Center in Monroeville. Please indicate your interest by notifying Dr. Kal Sen, P.E. at [senkk@ieee.org](mailto:senkk@ieee.org) or (724) 696-1611 no later than April 9, 2008.

#### **DIRECTIONS TO WESTINGHOUSE ENERGY CENTER:**

From Pittsburgh take Interstate 376 East (Parkway East). Take Exit 14A to Monroeville. Cross Business Rt 22 at the traffic light and proceed on Rt 48 South (Moss Side Blvd) approx ½ mile (two traffic lights). The 2<sup>nd</sup> traffic light is at a 4-way intersection with an Exxon station on the right. Turn left onto Northern Pike. Proceed approx 0.2 miles and turn right at the 1<sup>st</sup> traffic light onto Westinghouse Dr. Travel 0.7 miles (past the guard stand) to the 3 flags where the building's main entrance is located. Parking in the evening will be plentiful. Use the main entrance and check with the security guards inside. You will be directed to the proper room for your meeting.

From the PA Turnpike, take Exit 57 (Monroeville). After the toll plaza, get in the left lane to get on Business Rt 22 West. At the first light, turn left onto Rt 48 South (Moss Side Blvd) and follow the above directions.

- ***Radiation pressure and the linear and angular momenta of the electromagnetic field***

**Date/Time:** Thursday, April 10, 6:15PM to 8:30 PM

**Dinner:** We are offering (optional) pizza, drinks, and desert at a cost of \$7, to be paid at the event on October 11<sup>th</sup>. Please indicate on your RSVP whether you will plan to bring \$7 for pizza.

**RSVP:** ***RSVP is absolutely necessary for this event as Seagate is a closed facility.*** Please RSVP to [kxc24@psu.edu](mailto:kxc24@psu.edu) by April 2, indicating whether you would like to purchase dinner. We appreciate it if you can RSVP as soon as you can determine your plans. Also even if you are not coming, it is very helpful to us if you can let us know, and even provide a reason, so that we can better plan future events.

**Location:** Seagate Research, 1251 Waterfront Pl, Pittsburgh, PA 15222. Located along the Allegheny river next to the Heinz History Center and the David L. Lawrence convention center. Thanks to Ganping Ju and Seagate for hosting our meeting! We will have a brief tour of Seagate facilities after the talk.

**Speaker:** Masud Mansuripur, College of Optical Sciences, The University of Arizona, Tucson, Arizona 85721

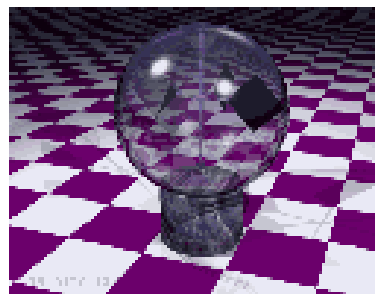
**Sponsors:** Magnetics Society Pittsburgh Chapter and Western Pennsylvania Optical Society of America



**Abstract:** Johannes Kepler was the first to suggest that radiation pressure was responsible for the comets' tails pointing away from the Sun. In 1871, Maxwell used his new electromagnetic theory to quantify the strength of the radiation pressure. Maxwell's predictions were verified by the experiments of Lebedev (1900) and Nichols and Hull (1901). The feeble pressure was detected by allowing the radiation to fall upon a delicately poised vane of reflective metal.

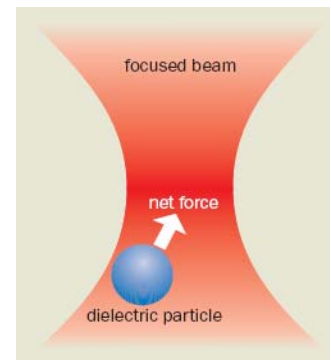


In free space a photon of wavelength  $\lambda$  carries a momentum  $p=h/\lambda$ , where  $h$  is Planck's constant. Thus when an atom emits or absorbs a photon its momentum changes in accordance with Newton's laws of motion. Similarly, when reflection or refraction from a particle changes the direction of a light beam, the particle experiences a force. The first optical traps employing these principles were built in 1970 by Ashkin. Levitation traps used the upward-pointing radiation pressure to balance the pull of gravity,



whereas two-beam traps relied on counter-propagating beams to trap particles. In 1986, Ashkin and coworkers used a single, tightly focused laser beam to trap a transparent particle in three dimensions. Such "optical tweezers" are particularly useful when working with biological samples, because conventional manipulators can contaminate the sample. In conjunction with microfluidic devices, optical tweezers are now used routinely to manipulate biological and other samples, and also to drive/control micro-pumps, micro-valves and micro-reservoirs.

In this presentation we describe the nature of radiation pressure in dielectric and magnetic media, and show, among other things, that the optical momentum density inside dielectric media has equal contributions from the traditional Minkowski and Abraham expressions. In magnetic materials (including negative-index media) the Lorentz law of force,  $\mathbf{F} = q(\mathbf{E} + \mathbf{V} \times \mathbf{B})$ , requires an additional term in order to remain consistent with the law of conservation of momentum; this additional term then accounts for Shockley's hidden momentum. The generalized form of the Lorentz law, in conjunction with 3D Maxwell solvers, yields the distribution of fields and forces in diverse systems of practical interest.



**About the speaker:** Masud Mansuripur received his PhD in Electrical Engineering from Stanford University in 1981. He has worked at Xerox Palo Alto Research Center, Xerox Research Centre of Canada, and Boston University's department of Electrical Engineering; he is currently a professor and Chair of Optical Data Storage in the College of Optical Sciences of the University of Arizona in Tucson, where he has been a member of the faculty since 1988. Professor Mansuripur is the author of "Introduction to Information Theory," (Prentice Hall, 1987), "The Physical Principles of Magneto-optical Recording," (Cambridge University Press, 1995), and "Classical Optics and Its Applications," (Cambridge University Press, 2002). He has published over 250 papers in technical journals, and given numerous presentations at various national and international forums. Professor Mansuripur's areas of research include: optical and molecular data storage, interaction of light with micro- and nano-objects, and the theory of radiation pressure, as well as its application in optical micro-manipulation.

## • *Biomechanics and Motor Control of the Hand*

**DATE:** Thursday, April 17, 2008  
**TIME:** 5:50-6:00 pm—refreshments; 6:00-7:00 pm—seminar  
**LOCATION:** 360 Benedum Hall, University of Pittsburgh, Pittsburgh, PA 15261 (a campus map is available at <http://www.tour.pitt.edu/tour-firstmap.html>)  
**SPEAKER:** Prof. Zong-Ming Li, Ph.D, Director of Hand Research Laboratory, Department of Orthopaedic Surgery, University of Pittsburgh  
**SPONSOR:** Engineering in Medicine and Biology Society, Pittsburgh Chapter

**Abstract:** The human hand offers unique research opportunities because of its anatomical complexity, functional versatility, and pathological vulnerability. In this lecture, the speaker will present a series of research studies pertaining to the biomechanics and motor control of the hand. Exemplary projects include manipulation mechanics, finger coordination, carpal tunnel mechanics, imaging analyses, morphological studies, finite element analysis, biomechanical modeling, neural network modeling, and so on. Clinical applications to carpal tunnel syndrome will also be highlighted. These studies demonstrate the utility of a variety of engineering tools to enhance our understanding of the hand as well as to improve the management of hand disorders.

**Bio:** Dr. Zong-Ming Li is currently an Associate Professor at the University of Pittsburgh in the Departments of Orthopaedic Surgery, Bioengineering, and Occupational Therapy. In the Department of Orthopaedic Surgery, Dr. Li serves as the Director of the Hand Research Laboratory where he and his lab team work on innovative studies involving the human hand. Dr. Li is also a Faculty Member at the McGowan Institute for Regenerative Medicine at the University of Pittsburgh.

Before joining the University of Pittsburgh, Dr. Li was an Assistant Professor of Physical Therapy as well as the Director of the Motor Function Laboratory at Walsh University in Ohio from 1998 to 2001. Prior to coming to the United States, he was a researcher at the Shanghai Institute of Orthopaedics and Traumatology in Rui Jin Hospital from 1992 to 1995. Dr. Li earned his B.S. in Engineering Mechanics from Southwest Jiaotong University and his M.S. in Engineering Mechanics and Musculoskeletal Biomechanics from the Chengdu University of Science and Technology in China. He received his Ph.D. in Kinesiology/Biomechanics in 1998 from the Pennsylvania State University.

Dr. Li has broad research interests in biomechanics and motor control of the neuromusculoskeletal system. His clinical research efforts focus on utilizing multidisciplinary approaches to study carpal tunnel syndrome. Current and prospective research areas include: neuromuscular control of the hand and fingers, hand motor function, finger joint stiffness, wrist kinematics and kinetics, carpal tunnel morphometry, carpal tunnel mechanics, and molecular mechanisms of the transverse carpal ligament and the tenosynovium.

**• Annual History Dinner - RSVP Now!**  
**Topic: America is Eating its Feed Corn**

**Speaker:** Dr. Richard Thompson, University of Pittsburgh, School of Information Science  
**Date:** Thursday, April 24<sup>th</sup>, 2008  
**Time:** 5:30 PM Social and Dinner; 7:00 PM Award presentations and speaker's presentation  
**Place:** Church of the Ascension, the corner of Neville and Ellsworth in Oakland (4729 Ellsworth Ave. Pittsburgh PA 15213) for map and directions, see <http://maps.google.com/maps?q=4729+Ellsworth+Ave,+Pittsburgh,+PA+15213,+USA&sa=X&oi=map&ct=title>. Parking spaces are available along the Neville St. side of the Church, and in the Oakland Catholic High School's parking lot on Neville (next to the large green tiled building) across from church.  
**Cost:** \$20 per member; \$35 member plus guest; NO CHARGE for program only.  
**RSVP REQUIRED:** by April 18<sup>th</sup>, with check, payable to "IEEE Pittsburgh Section, to Joe Cioletti, 684 Blueridge Dr., Pittsburgh, PA 15239

Buffet provided by *The DEACON and Denise* featuring Marinated Grilled Pork Tenderloins and Chicken Marengo (boneless chicken breasts with artichokes, peppers and tomatoes).

The history and awards dinner will be at a central location in Oakland this year. This is a great event to bring your spouse or significant other to. It's also a great opportunity to get together with your electrical engineering buddies you haven't seen in a while. Call them and make plans to attend the dinner and catch up with each other.

**Abstract:** America's economy has depended on innovation for the past 150 years, but our investment in innovation has declined over the last 15 years. The purpose of this talk is to explain this dependence and to alert the audience to a serious national problem before it becomes a national emergency. The rationale is historical, from the fall of Rome to Ford and Edison. But, we'll carefully track the last 60 years: from the "happy days" to Sputnik and OPEC and SDI and, finally, to our current "post-Wall" economy.

**About the Speaker:** Dr. Richard A. Thompson has been a Professor of Telecommunications at the University of Pittsburgh since 1989, after 20 years at AT&T's Bell Laboratories. He was the Chair of Pitt's Telecom Program for 16 years, has a secondary appointment in Pitt's EE Department, and is affiliated with Pitt's undergraduate Photonics Program. His BS and MS degrees, each in EE, are from Lafayette College and Columbia, respectively. His PhD, in Computer Science, is from the University of Connecticut. Besides peripheral research interests in human-computer interaction and probabilistic automata (with application in statistical packet dependence), Dr. Thompson's principal research area is communications switching, especially photonic switching and Voice over IP. Dr. Thompson is a former chair of the IEEE Comsoc Technical Committee on Switching and Routing. He has over 90 research publications, including two textbooks, Telephone Switching Systems and The Physical layer of Communications Systems. He is a founding board member of the International Telecommunications Education and Research Association and received ITERA's Research Career Award in 2007.

- ***Spintronic biochips for biomolecular recognition***

**Place:** Seagate Research Center Auditorium  
**Date:** Thursday, April 24<sup>th</sup>, 2008  
**Time:** Social (w/ Lunch served): 11:30AM, Technical Program: 12:00 PM  
**Speaker:** IEEE Magnetics Society Distinguished Lecturer Prof. P.P.Freitas, INESC MN, Lisbon, Portugal and Physics Department, Instituto Superior Tecnico, Lisbon, Portugal

**Abstract:** Integrated spintronic biochip platforms are being developed for portable, point-of-care diagnostic applications. The platforms consist of a microfluidic unit where the bioassay takes place, an arraying and detector chip consisting of target arraying current lines and integrated magnetoresistive sensors, and electronic control and readout boards. Probe biomolecules are immobilized by microspotting over sensor sites, and target biomolecules, labeled with magnetic nanoparticles are arrayed over the probe sites ( magnetically assisted hybridization). After proper washing, hybridized targets are recognized by the fringe fields created by the magnetic beads, detected by the incorporated magnetoresistive sensors. Detecting geometries will be reviewed, using either out-of-plane or in-plane bead excitation, and dc or ac detection/excitation. Detection limits using spin valve and tunnel junction sensors will be presented, depending ultimately on platform electronic noise, and sensor noise characteristics. Applications to gene expression chips ( Cystic Fibrosis gene mutation detection) and immuno assay chips ( anti-body-antigen recognition, e-Coli, Salmonella detection) will be presented. Spintronic biochip are also being integrated into multi -module lab-on-chip platforms including i) biomolecule extraction from biological fluids ( magnetophoresis ), ii) PCR modules ( if required), and iii) the biomolecular recognition module. Alternative spintronic biochip geometries will also be presented ( lateral flow biosensors), where a magnetoresistive reader scans the surface of a porous strip, where labeled target biomolecules bind to immobilized probes. Finally, a brief review of other biomedical applications of magnetoresistive sensors will be given, from hybrid sensors targeted at biomedical imaging, to magnetic tweezers/sensors for DNA translocation monitoring.



**Paulo Freitas** is a Full Professor of Physics at the Instituto Superior Tecnico (IST) in Lisbon, and the Director of INESC Microsystems and Nanotechnologies. Current research topics include MRAMS, read heads for ultra high density recording, magnetoresistive biochips, and sensors for biomedical applications. He has been involved in research in the area of magnetoresistive materials and devices since he received his Ph.D in Solid State Physics from Carnegie Mellon University in 1986. His PhD thesis was on the subject of anisotropic magnetoresistance of ferromagnetic thin films and alloys. He then joined IBM Research at Yorktown Heights as a post doctoral fellow working on high-TC superconductivity and transport properties of ferromagnetic thin films. In 1988 he joined INESC in Lisbon, where he started the Solid State Technology Group. In 1989 he became Professor of Physics at

the Instituto Superior Tecnico in Lisbon. From 1992 to 1996, he was responsible for the start up and operation of INESC's ASIC back-end of the line microfabrication facility. From 1996 till now, his research areas expanded to magnetoresistive read elements for magnetic data storage, magnetoresistive sensors, MRAMS, and biomedical applications including magnetoresistive biochips. He became

director of INESC Microsystems and Nanotechnologies in 2001, and Full Professor of Physics at IST in 2002. Over this period, he co-authored over 200 technical papers and several chapter books. Professional activities include membership in IEEE, participation in several Publication/Program/Advisory Committees of MMM and Intermag Conferences.

This meeting will be of particular interest to the members who belong to **IEEE Magnetics Society**, and others are also very welcome. Please RSVP to [Ganping.Ju@Seagate.com](mailto:Ganping.Ju@Seagate.com) to help us prepare the lunch.

**Directions to Seagate Research Center:**

Seagate Research Center is located at 1251 Waterfront Place, Pittsburgh, in the Strip District, across from the Heinz History Center and next to the Convention Center.

- ***"Introduce a Girl to Engineering"***

In conjunction with National Engineer's Week, a program called "Introduce a Girl to Engineering" offers the engineering community an opportunity to develop programs focused on (you guessed it!) introducing young girls to the field of engineering. The program can and does take many forms depending on who is leading the program, where the program is conducted and who the target audience is.

The Pittsburgh Women in Engineering (WIE) Affinity Group would like to develop an "Introduce a Girl to Engineering" program for the Pittsburgh area. We have started a lead list of junior high and high schools interested in bringing a program to their school, but would like to solicit the Pittsburgh IEEE section for additional feedback and opportunities.

Programs range from seminars (ex. A 1-hour program identifying how engineers affect a community) to teaching opportunities (ex. An engineer teaches Physics classes for a day). The program(s) can also target parents, teachers and guidance counselors so to educate these important influencers on the potential degrees and careers available and associated benefits, and also the best way to promote the field to young boys and girls.

If you have ideas or suggestions for a program, or would like to provide lead information for a junior high or high school in need of a program described above, please contact Jennifer Ploskina at [jenniferploskina@eaton.com](mailto:jenniferploskina@eaton.com) or 412-716-2066 cell.

- ***Nanorobotics - Theory and Applications of Artificial Neural Networks***

**I. Introduction**

In recent years a great deal of efforts and excitement has been directed toward an area of artificial intelligence called Neural Networks. A group of psychologists, scientists and mathematicians known as "connectionists" have created new mathematical models to show how the neurons in the human

brain work, and computer scientists are constructing neural networks that mimic the complex activity of the brain.

The human brain uses trillions of neurons with complex synapse connections, yet each neuron operates quite slowly in comparison to modern day computers. The power of the brain lies in its ability to process data in a parallel fashion; that is, to use more than one neural pathway at a time. For the most part, modern day computers operate in a sequential fashion rather than in a parallel fashion. While much research is continuously underway to develop computers with parallel processors, the approach to Neural Networks described in subsequent parts of this article simulates the parallel process on a microcomputer system.

Many software constructs are presently available for microcomputers to simulate Neural Networks. Actually, with relatively inexpensive hardware and software, experimenters can simulate a small part of the human brain on personal computers. One such software is the well known "NeuralNetworks Explorer, developed by NeuralWare. This software was used to develop the network described in the introductory part of this article.

The fundamental objective of this article, however, is to present the most important applications of Neural Network both in simulator as well as in electronics hardware systems.

Guy M. Nicoletti, Ph.D.  
University of Pittsburgh at Greensburg  
Engineering Department

[nicolett@pitt.edu](mailto:nicolett@pitt.edu)  
[nicolett@verizon.net](mailto:nicolett@verizon.net)

### • *Local Job Opportunity*

**Electromagnetic Development Engineer**

Pennsylvania - Pittsburgh

- Willingness to Travel - Occasionally
- Must have PhD, must have computational electromagnetic algorithms and finite element methods

Contact: Janice Weber

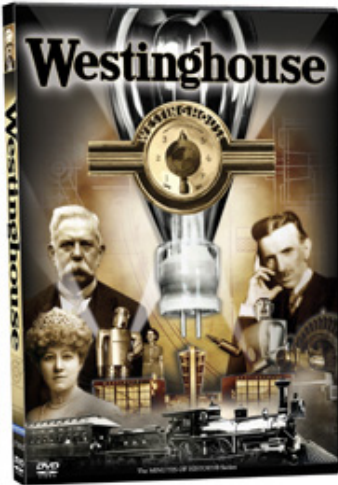
Project Manager

[Janice@bensoning.com](mailto:Janice@bensoning.com)

1-800-720-9790 Ext. 210

- ***Westinghouse Documentary Released***

A Pittsburgh Film Company, Inecom Entertainment Company, has produced a documentary on George Westinghouse that may be of interest to IEEE members. Westinghouse is a feature-length documentary about the life and times of George Westinghouse, his companies, legacy, personality and achievements. George Westinghouse is considered America's greatest industrialist and the only man who would go up against Thomas Edison, and win.



Westinghouse was filmed in cooperation with the George Westinghouse Museum and features rare and never before seen footage, industrial films and photos previously buried deep within the Westinghouse archives. Filmed in High Definition, the film includes an interview with George Westinghouse Museum Executive Director, Edward J. Reis.

The DVD will be available in stores nationwide on Tuesday, April 8, 2008. For more information on the film, see the company's website, Westinghouse.

- ***Power Quality Tutorial***

**Speaker:** Tom Dionise, Senior Power Systems Engineer, Eaton Electrical

**Date:** Saturday, June 7, 2008

**Time:** Registration – 7:30 AM with coffee and donuts,

**Tutorial:** 8:00 AM to 4:00 PM, Lunch from 12:00 to 1:00

**Place:** Eaton Electrical, 130 Commonwealth Dr., Warrendale, PA

**Cost:** IEEE Members \$50.00

Non-Members \$75.00

Students \$25.00

**Sponsors:** Power Engineering Society/Industry Applications Society

**RSVP:** **Required by May 29, 2008.** For more information, contact Andy Novotny at [andrewnovotny@ieee.org](mailto:andrewnovotny@ieee.org) or 412-963-5510. Please make registration checks payable to IEEE Pittsburgh Section and mail to Andrew Novotny, 514 Price Avenue, North Braddock, PA 15104.

**Abstract:** This Tutorial will cover Power Quality issues and their available solutions. Some of the topics to be covered are power surges and sags, harmonics, and power factor. Theory will be combined with actual demonstrations in Eaton's Power Quality Solutions Lab to give the attendees a better understanding of the power quality issues and their available solutions.

**Directions to Eaton Electrical:** From downtown Pittsburgh take I-279 North for 13 miles and merge into I-79 North. After 4 miles, Exit I-79 North at Exit 75, Warrendale. At the traffic light at the end of the exit ramp, turn left onto Warrendale-Bayne Rd. Turn right at the Park N Ride onto Brush Creek Rd. At the second traffic light at the intersection with Thorn Hill Rd, Brush Creek Rd becomes Commonwealth Dr. Continue on Commonwealth for about 0.1 mile, and then turn left into 130 Commonwealth Dr.

- ***Career Survival for Engineers and Scientists in the 21st Century***

The Power Engineering Society and Industry Applications Society of the IEEE Pittsburgh Section is planning to have a 1-day career management seminar developed by the IEEE-USA Career & Workforce Policy Committee in cooperation with the IEEE-USA Employment and Career Services Committee on July 19, 2008, the Saturday before the PES General Meeting in Pittsburgh.

The goal of this seminar is to show you how to prepare yourself to manage or run your career in this era of globalization and selective hiring. Some topics to be discussed by the speakers include:

- Changes in the job market
- Requirements of the job market and how you relate to the market
- Adapting to new workplace
- Knowing personal weaknesses and strengths
- Starting a personal career plan, values statement and branding
- New methods of job searching
- Understanding the interview process
- How to use IEEE resources to help yourself to try new innovative job searches

If you are interested in enhancing your career by empowering yourself to work with management and human resources to innovate your own career in the 21<sup>st</sup> century, this is for you. The first step is to let us know if you have an interest in attending a seminar of this caliber. There will be a nominal fee for this seminar. Lunch will be provided. We need your response to have a count to have the proper venue. Please e-mail Andrew Novotny at [andrewnovotny@ieee.org](mailto:andrewnovotny@ieee.org) to reserve your place for this important seminar.

- ***Raise Your Company's Profile***

Show your supervisor that you are not just an excellent engineer, but you have business acumen as well. Point out the excellent opportunity to advertise your company when the Power Engineering Society's General Meeting is held in Pittsburgh for five days in July, 2008. Over 1800 electric power professionals from around the world are expected to attend. The group will include manufacturers, consultants, electric utility employees, and more. Your company could provide pens or post-its with your logo for each participant, support a bus taking participants to a technical tour, advertise on-line at the General Meeting web site, or do all three and more. Prices start at \$750. To learn the details, go to <http://ewh.ieee.org/cmte/PESGM08> and click on *Raise Your Company's Profile* in the left column. There you'll find a complete letter that you can give to your supervisor or your company's marketing department. It details all the various opportunities available for supporting the General Meeting while advertising your company.

Your company's advertising also has the potential to benefit the IEEE Pittsburgh Section. The Pittsburgh Chapter of PES/IAS will receive up to \$7500 if the General Meeting's income exceeds its expenses by a sufficient amount. So do it for you and for your company and for IEEE Pittsburgh. If you have questions, email Jace Cochrane at [jacejc@pghmail.com](mailto:jacejc@pghmail.com).

## 2008 Calendar – Meetings of IEEE Pittsburgh Section

	Jan	Feb	Mar	Apr	May	June	July	August	Sept	Oct	Nov	Dec
Executive Committee	17 - 7pm Panera Bread Oakland	21 - 7pm Panera Bread Oakland	28 – 5:30pm UP Greensburg	17 - 7pm Panera Bread Oakland								
Section		16 Engineers Week table		24 History Dinner								
Communi- cations		1 Contention Resolution										
Computer		16 Robot car race										
EMBS			20 <i>Neural Engineering</i>	3 - Sensor- motor 17 – Bio- mechanics								
EMCS												
PES/IAS	16 - AdCom 6:00 PM 23 - Why not nuclear	20 - AdCom 6:00 PM Panera Bread Penn Center 13 –Buildings 27 - Electric Vehicle	12 Thermal Systems 12 July 2008 PESGM LOC mtg; 26 Universe	2 Obtaining PE License 9 July 2008 PESGM LOC mtg 29 - AdCom	7 - July 2008 PESGM LOC mtg	7 Tutorial 12- July 2008 PESGM LOC mtg	9-loc. mtg 20-24 - PESGM 19 Career Survival					
Magnetics			5 Nanomagnetic bits	10 - Radiation pressure 24 - Spintronic								
Robotics												
Signal Processing												
Social Impl of Technlgy			28 Utility Meter									
Upper Mon	28 Biomolecul ar Detection Device	4 Radio Astronomy										
Women in Engineering	10 Inaugural Meeting											
Life Member												
GOLD												
PACE												
Student Activities												