



## Nuclear and Space Radiation Effects— NSREC2017 New Orleans, Louisiana, USA

### CONFERENCES

NSREC2017 1

### SOCIETY GENERAL BUSINESS

President's Report 2  
Secretary's Report 3  
New AdCom Members 3

### TECHNICAL COMMITTEES

CANPS 4  
NMISC 4  
Pulsed Power 4

### FUNCTIONAL COMMITTEES

Awards 5  
Chapters 6  
Alexandria Student Branch Chapter 6  
Publications 7

### ARTICLES

Contributions to JET's Disruption  
Prediction System 7

The 54<sup>th</sup> annual Nuclear and Space Radiation Effects Conference (NSREC) will be held July 17<sup>th</sup>–21<sup>st</sup>, 2017, at the New Orleans Marriott hotel. Our committee has worked hard to offer an interesting venue and outstanding program for this year's conference. We will continue the tradition of previous NSRE Conferences by offering a Technical Program, a one-day Short Course that precedes the technical sessions, a Radiation Effects Data Workshop, and an Industrial Exhibit. Engineers, scientists, and managers from around the world who are interested in radiation effects will attend. Véronique Ferlet-Cavrois, European Space Agency, is the General Conference Chairwoman.



Véronique Ferlet-Cavrois  
NSREC 2017 General Chairwoman

Technical and social programs have been planned to maximize opportunities for information exchange and networking in the areas of radiation effects in microelectronics and photonic devices, circuits, and systems. Supporters of the conference include 3-D Plus, BAE, Boeing, Cobham Semiconductor Solutions, European Space Agency, Freebird

Semiconductor, Intersil, International Rectifier HiRel Products, Jet Propulsion Laboratory, Southwest Research Institute, and VPT Rad.

### TECHNICAL PROGRAM



Heather Quinn  
Technical Program Chair

The Technical Program Chair, Heather Quinn, Los Alamos National Lab, and her committee have assembled an outstanding set of papers that are arranged in ten oral sessions and a poster session for the Technical Program. Those papers are eligible for publication after the conference in the IEEE *Transactions on Nuclear Science*, subject to further review. A Radiation Effects Data Workshop is also included in the Technical Program, with papers that emphasize data on electronic devices and systems, and descriptions of new simulation tools and radiation test facilities. In addition to the contributed papers, three invited talks will be presented that are of general interest to conference attendees and their companions. Guest speakers are:

"The Waters of Katrina: What the Storm Taught New Orleans about Its Land, People, and Problems," by Eve Troeh;

"The Mars Reconnaissance Orbiter and the Curiosity Rover: Perspectives on Whether Mars is Habitable," by Tanya Harrison, Arizona State University; and

"New Orleans and the Early Days of Jazz," by Richard Scott.

The IEEE WIE speaker will be Mary Beth Stevens, Los Alamos National Laboratory; her title is "Negotiation and Communication."

### SHORT COURSE



Jonathan Pellish  
Short Course Chair

Jonathan Pellish, NASA Goddard, is the chair of this year's Short Course. The theme of this year's course is "Hardness Assurance for Satellite Systems—from Macro to Nano."

CONFERENCES Continued on PAGE 2

## Conferences Continued from PAGE 1

The course will be held on Monday, July 17<sup>th</sup>, and is an excellent learning opportunity for those who are new to the field as well as those who want to stay abreast of current issues.

**Topics and speakers for the four sessions of the Short Course are:**

*Total Nonionizing Dose and Displacement Damage Hardness Assurance for Satellite Systems*, by Dr. Christian Poivey, European Space Agency ESA/ESTEC

*Single-Event Effects Radiation Hardness Assurance for Satellite Systems*, by Dr. Ray Ladbury, NASA/GSFC

*Introduction to SmallSats and Correlating Factors for Mission Success*, by Prof. Michael Swarthout, Saint Louis University

*Design Principles for Mission Success in Spacecraft Programs*, by Dr. Dave Roth, John Hopkins Applied Physics Lab

### SOCIAL EVENTS



**John Stone**  
Local Arrangements Chair

John Stone, Southwest Research Institute, is the Local Arrangements Chair. A very interesting social program will take place in New Orleans. The Conference Social, *A Night in Old New Orleans*, will be held on Wednesday evening at the Mardi Gras Museum, providing an indoor venue in a replica of an old plantation house, as well as the opportunity to view some of the floats used in the Mardi Gras parade. Three companion events include a New Orleans City Tour, a New Orleans Cooking School and the National World War II Museum.

### INDUSTRIAL EXHIBIT

Anne Minez, 3D-Plus, is the Industrial Exhibit Chair. The exhibit will allow conference attendees to discuss new developments in radiation-hardened and radiation-tolerant electronics, engineering services, facilities, and equipment with participating vendors. A reception will be provided on Tuesday evening in the exhibit area for attendees and their

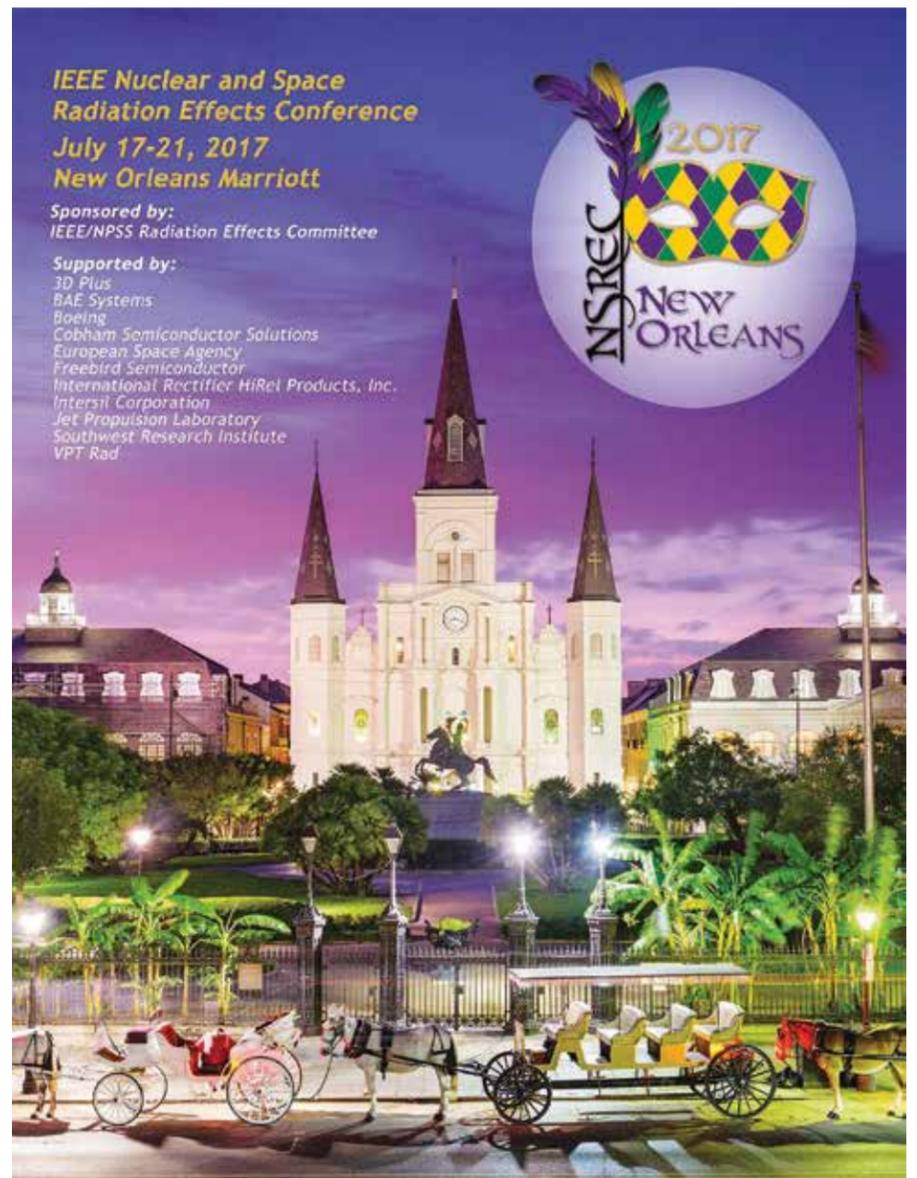
### THE CURRENT LIST OF EXHIBITORS INCLUDES:

- » 3DPlus
- » Analog Devices
- » Anaren
- » BAE Systems
- » Boeing
- » Cobham Semiconductor Solutions
- » Cypress/DPACI
- » Data Device Corporation
- » EMPC
- » Foss Therapy Services
- » Freebird Semiconductor Corp.
- » HiRel Products
- » Honeywell
- » Hopewell Designs Inc.
- » International Semiconductor
- » Intersil Corporation
- » Xblue
- » J. L. Shepherd & Associates
- » JD Instruments
- » Lawrence Berkeley National Laboratory
- » Los Alamos National Laboratory
- » Microchip
- » Micropac Industries
- » Microsemi
- » Micross
- » Modular Devices
- » Northrop Grumman
- » Robust Chip Inc.
- » Silvaco
- » Synopsys Inc.
- » Texas A&M Cyclotron Institute
- » Texas Instruments
- » ULTRA TEC
- » Vanderbilt University/ISDE
- » Vorago Technologies
- » VPT Inc.
- » VPT RAD

companions that showcases the Industrial Exhibit. If you need more information about the exhibit, please visit <http://www.nsrec.com>, or contact Anne at [aminez@3d-plus.com](mailto:aminez@3d-plus.com).

### NEW ORLEANS, LOUISIANA

Just north of the gulf of Mexico, on the banks of the Mississippi River, lies New Orleans, a 300-year-old melting pot of cultures, sights, tastes, and sounds with something for everyone. If you're a WWII buff, be sure to visit the National WWII museum for an immersive experience. If your preference is the natural world, the Audubon Zoo and Aquarium are regularly rated in the top ten. If history is your bag, visit the New Orleans Jazz National Historical Park, and take in a live concert, or spend a day at the Jean Lafitte National Historical Park and Preserve learning about New Orleans' very own pirate. Architecture buffs will enjoy a walking tour of the mansions in the



Garden District and exploring the Spanish-influenced architecture of the French Quarter. All are reachable by a short walk or an easy trolley or bus ride from the conference hotel.

Alternatively, you may contact the General Chairwoman, *Véronique Ferlet-Cavrois*, European Space Agency, at [veronique.ferlet-cavrois@esa.int](mailto:veronique.ferlet-cavrois@esa.int).

When in New Orleans, don't forget the food. Whether the cuisine is classic and refined Creole, its spicier rural cousin Cajun, or any of the creative fusion efforts for which New Orleans is justly famous, it is hard to get a bad meal. Take a short walk after dinner to visit the live music scene on Frenchman street, where world-class musicians play nightly, and locals take in the scene. New Orleans is the birthplace of Jazz, but you can find Latin, blues, Reggae, or some mixture of them all. Whatever you like, you can find it in New Orleans.

You may also contact the Publicity Chair, *Teresa Farris*, Cobham Semiconductor Solutions, at 719-594-8035, or E-mail: [teresa.farris@cobham.com](mailto:teresa.farris@cobham.com).

### ADDITIONAL INFORMATION

For the latest information on the conference, including the technical program, local arrangements, hotel and travel information, and registration forms, please visit our web site at <http://www.nsrec.com>.

### QUESTION OF MOTIVES, THEIRS AND OURS

We count the courtesies accorded to us by unpopular people as offences.

*Friedrich Nietzsche*

### QUICK CHANGE ARTIST

It doesn't much signify whom ones marries, for one is sure to find next morning that it was someone else.

*Samuel Rogers*

### SOCIALISTS DISAGREE

What kind of society isn't structured on greed? The problem of social organization is how to set up an arrangement under which greed will do the least harm; capitalism is that kind of system.

*Milton Friedman*

## President's Report



**Stefan Ritt**  
IEEE NPSS President

I'm writing this article on my flight back from Japan, where I had several meetings and gave a seminar. As always, I'm impressed with the different culture in Japan, about the diligent and accurate way people work there. With IEEE expanding more globally, and especially to Asia, I personally believe that Japan

offers a great opportunity to host some of our conferences in the future. Maybe you have read the article *Meetings in Japan: Ski Slopes to Tropical Beaches* in the last IEEE Spectrum. It mentions that IEEE sponsored 50 meetings there in 2016; and that costs are now competitive, especially when going to smaller cities. As I have been visiting Japan for many years now, I realize that getting around has now become much easier. More and more signs, even outside of big cities, are now in English; many things including public transportation can be paid for with an integrated prepaid contactless smart card, and for the first time I got a reasonably priced prepaid Japanese SIM card for my phone, which gave me Internet everywhere. This was very handy especially for the improved Google translator App, which can now read Japanese characters through the camera and translate them in real time to English. As you might know, there is the proposal

to build the International Linear Collider (ILC) in Japan. This is a multibillion dollar project, which includes technologies in our fields of interest including accelerator physics, particle detectors, radiation effects and engineering, as well as real-time computing. While this will be a large international project, many engineers and physicists from Japan will be involved. I think it's important to bring these people into contact with IEEE, which can be best done through conferences held in their country. They will stay technically current, exchange ideas

and experimental results with peers in their field and intensify international networking. They will realize the benefits of our community, become members and maybe even become active volunteers, and then in the end build a better accelerator. A similar case exists right now in China, with the planned Circular Electron-Positron Collider (CEPC). I remember the first IEEE Real-Time Conference we organized in 2009 in Beijing, China. Many students, engineers and scientist from China came to an IEEE conference for their first time. They saw

### NUCLEAR & PLASMA SCIENCES SOCIETY NEWS

(USPS 000-560) is published quarterly by the Nuclear & Plasma Sciences Society of the Institute of Electrical and Electronics Engineers, Inc. Corporate Office: 3 Park Avenue, 17<sup>th</sup> Floor, New York, NY 10017-2394, [iee.org](http://iee.org). Printed in the USA. One dollar per member per year is included in the Society fee for each member of the Nuclear & Plasma Sciences Society. Periodicals postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to Nuclear & Plasma Sciences News, IEEE, 445 Hoes Lane, Piscataway, NJ 08854.

the benefits of their participation, and now have followed this conference series for many years, even outside of Asia. Many of them have become IEEE members. Getting the people building these new exciting accelerators into our community is a great opportunity we should not miss.

Several new things have happened in our society. We saw the first issue of our new journal *Transactions on Radiation and Plasma Medical Sciences* (TRPMS), which is co-sponsored by the Engineering in Medicine and Biology Society (EMBS). It bundles all articles with medical sciences content, which were covered previously by our TNS and TPS journals. This allows much wider exposure within the medical community, especially once it is indexed in PubMed, which will be requested as soon as possible. I would like to thank Dimitris Visvikis, who made all this possible.

We also have two new student branch chapters, one at the Institut de l'aeronautique et de l'Espace in France and one at the Instituto Tecnológico de Costa Rica. It is especially hard to become an IEEE

member and pay the membership fees in countries where the average income is well below that of developed countries. One thing many people do not know is that there is "minimum income" clause in our membership fee structure. Applicants with an annual income below US\$14,900 qualify for a 50% reduction in IEEE and society membership dues and publications. Please spread this information to your colleagues who might qualify for that.

We had our first AdCom meeting and retreat this March in St. Augustine, FL. With us were nine new AdCom members, four of them are women and five are from regions 7 and 8, which ensures we have a good diversity in regions and gender. As a special guest we had Rafal Sliz, 2017 IEEE Young Professionals Chair, who introduced many new ideas concerning Young Professionals to our society. A group picture has been posted to our AdCom web page at <http://ieee-npss.org/adcom-info>. We had intensive discussions about future initiatives such as new instrumentation schools and common software packages for our conferences. A web site is in preparation that

will act as a central place of information for our current and future conference organizers. Available conference software will be listed, together with a feature comparison and general documentation for both conference attendees and organizers. Sharing software across several of our conferences will save costs, leverage synergies and improve the user experience especially for people involved in more than one conference. Appointing Martin Grossmann as our new social media liaison will strengthen our social media outreach. Please subscribe to the IEEE NPSS Facebook page to receive updates on all our activities. The NPSS Wikipedia page (did you know that there is one?) has been updated to reflect recent changes such as our new journal.

An interesting new project was introduced at the last Technical Activities Board (TAB) meeting in February in New Orleans, LA. The IEEE DataPort project allows sharing of large datasets (up to 2 TB per set) to facilitate different analysis methods and to retain referenceable data for reproducible research. There exists a subscription model similar to our journals, but also an open access option under the Creative

Commons license. If you would like to learn more about this exciting project, please go to <http://ieee-dataport.org/>.

It is always a great pleasure for me to see the excitement of volunteers working in our organization, not only in AdCom but also through our journals and conferences. If you are interested to contribute, for example in reviewing manuscripts or helping organize a conference, I would highly encourage you to do so independent of your experience level. Volunteers are the heart and brain that keep our society running. Looking forward to see you at an upcoming conference, maybe in Japan.

Sincerely,



**Stefan Ritt, IEEE NPSS President, can be reached at the Paul Scherrer Institute, CH-5232 Villigen PSI, WBWA/140, Switzerland; Phone: +41 56 310 3728; E-mail: [stefan.ritt@psi.ch](mailto:stefan.ritt@psi.ch).**

## Secretary's Report



**Albe Larsen**  
IEEE NPSS Secretary and Newsletter Editor

First, my profound apologies to Chiara Guazzoni who was the author of the articles in the March Newsletter entitled *Radiation Instrumentation Awards Subcommittee Report*, as well as the Emilio Gatti memorial, which I incorrectly credited to Cinzia Da Vià.



**Chiara Guazzoni**

The Administrative Committee of the IEEE Nuclear and Plasma Sciences Society held its first meeting of 2017 on March 4<sup>th</sup> in St. Augustine, FL. The meeting was preceded by our annual retreat, designed to address a few topics in detail and have time for strategic planning for the year, as well as by Finance and Communications committee meetings.

We were pleased to welcome our new elected members and new technical and functional committee chairs at both the retreat and meeting.

Although returns from both conferences and publications are down, our treasurer, Ralf Engels, reports that we are in reasonable financial health and we were able to provide more initiative funding than originally planned. However, we could do better in closing our conference books, with some conferences back to 2014 still open. This is a potential source of difficulty.

The NPSS web-based budget tool has been moved and is now hosted on an IEEE server. This will become the preferred budget tool for all IEEE conferences by the end of 2017 when tool errors are fixed and a number of features are added.

Neither TPS nor TNS came within 5% of their 2016 page forecasts so neither will receive a bonus from IEEE Pubs.

Stefan Ritt, our new president, has written about much of what he discussed at our meeting, but while he mentioned reduced IEEE membership for those with an equivalent US income below \$14,700, he did not mention that a 50% reduction is also given for society memberships and for optional society publications. Make sure that if you fall into this category that you send a certification with your membership application.

Stefan also outlined various TAB initiatives including a few where NPSS technologies are directly involved including food engineering (plasma seed treatment and food sterilization) and real-time monitoring of ice and icebergs.

Overall our technical committees and the conferences they sponsor are doing well. Both the Particle Accelerator Science and Technology and the Pulsed Power Science and Technology committees are now elective and have established schedules for electing their steering or executive committee members. Upcoming conferences include the Symposium on Fusion Engineering which is being held in Shanghai and is SOFE's first excursion outside North America and Pulsed Power Science and Technology which is meeting in Brighton, UK—also its first excursion outside North America. ICOPS, NSREC, NSS/MIC/RTSD will all be held in the U.S. and RT-2018 will be held in Virginia.

The MOU governing U.S. sponsored PAC conferences has been revised and has now been signed off by the PAC OC, APS/DPB and IEEE/NPSS. The agreement is in effect for five years. An IUPAP working group on accelerators under Lia Merminga of SLAC has been established. Its first meeting was at IPAC'16 and it will meet again at IPAC 2017 (May 14-19, 2017). A scheme has also been developed for "light reviews" of NA-PAC and NA-IPAC papers to be included in a Conference Record, with a link and abstract in JACoW.

The 2016 NA-PAC held in Chicago had good technical and special sessions (Teacher's Day, Women in Science and Engineering, student poster, Lou Costrell Award), but attendance was low due to U.S. government travel restrictions and low attendance from Europe and Asia.

Plans for the 2018 NA-PAC in Vancouver, May 20–25, are now well along, with venue, budget and committee in place. The overall program schedule has been decided based on space constraints.

The 2017 NPSS awards were announced by Craig Woody who stepped in during Janet Barth's unanticipated absence. See the AWARDS section (p. 5) for names, citations and brief biographies of the recipients.

The Finance Committee met on Thursday, March 2 to discuss a request from PPST for a CB account, the NPSS reimbursement policy, *Transactions* special issues for unsupported conferences, and the distribution of NetWork Shop assets, among other topics. Several motions were presented to AdCom and appear below.

This is the time of year when the Communications Committee reviews its literature and decides what to use for the next two years. Membership booth banners are also being redesigned. This work is in process. We have changed our website provider to a group in IEEE IT, after Peter Clout, communications chair, and president Stefan Ritt met with them at a recent TAB meeting. Work to make new member signups electronic at our meetings is in process. This will get new members onto our membership roster much more quickly and in cases where there are fees to be paid, provide a mechanism. Very exciting for those of us who work at membership tables!

Our membership committee continues to work toward increasing membership in underrepresented areas as well as improving retention of current members. If you have ideas on what helps a new member become an involved, active member, contact Sal Portillo, our membership chair, at [sportil@unm.edu](mailto:sportil@unm.edu).

In his President's Report, Stefan has commented on the Young Professionals and Chapter activities. If you are interested in helping Young Professionals as a mentor or in doing communications or resume training, contact Christoph Ilgner at [Christoph.Ilgner@cem.ch](mailto:Christoph.Ilgner@cem.ch).

The big Publications news is that our new journal, *Transactions on Radiation and Plasma Medical Sciences* has been launched and the first issues are now out. Look for it and for the E-blast with content information. EMBS is our partner in this venture.

And Nominations are open for AdCom reps from CANPS, PPST, PSAC, RE and RI. If you have a great candidate in mind contact him or her and share the information with John Verboncoeur, our Nominations chair [johnv@msu.edu](mailto:johnv@msu.edu). Several technical committees are also holding elections for their steering groups or ExComs.

Our liaisons have also been busy with much activity in IEEE Smart Village, in the IEEE-USA R&D Committee which has defined its policy priorities for 2017-2018, and also in the Coalition for Plasma Science which will again present a plasma science award at the Intel Science Fair. We will again

technically cosponsor ICALEPCS in Barcelona in 2017 and again in New York in 2019. We also have a new WIE liaison, Cinzia Da Vià, who will assist with our conference WIE events and who is collecting data to help improve our WIE activities.

### ADCOM ACTIONS

» ComCom moves that AdCom approve a budget of up to \$4000 to support a student video competition.

The competition will be advertised beginning in June 2017 in the Newsletter, on the web and via Facebook with contributions due 15 December 2017.

The video shall be no more than two minutes long and shall be based on the importance and relevance of NPSS to the student. For example, the video might show the relevance of specific NPSS technology to his/her work. The video copyright must be assigned to IEEE.

The Awards Committee members shall be the chairs of the Awards, Communications and Membership Committees and up to three additional members they invite.

### Awards

First Prize: Up to \$2500 to attend the NPSS conference of his or her choice, plus certificate

Second Prize 128 GB iPad Pro (\$700) or gift certificate of equivalent value plus certificate

Third Prize: \$250 gift card plus IEEE certificate

The videos will be used on our web site, at conferences between sessions, at the Membership table, and elsewhere as NPSS deems appropriate.

The motion carried.

» It was moved by the Finance Committee and passed that publication of a conference-related special issue of a journal shall be at the discretion of the Editor-in-Chief of the journal, subject to approval by the appropriate Technical Committee Chair(s).

» Whereas the IEEE NPSS Bylaws (6.1) requires approval of the membership of the Nominating Committee, and

Whereas membership was defined in the Nominating Committee report to include each TC Chair, the Nominating Committee Chair, and the NPSS President as ex-officio,

## Secretary's Report Continued from PAGE 3

Be it resolved that the NPSS AdCom approves membership as identified by the Nominations chair. Moved and passed.

» IEEE Election Oversight Committee and Election Policy:

Whereas the IEEE Board of Directors (BoD) has proposed changes to the Election Oversight Committee (EOC) and Election Policy, and

Whereas the NPSS Administrative Committee (AdCom) has discussed said changes, and finds many antithetical to open discourse and transparent governance and election process, and

Whereas the NPSS AdCom concludes an EOC independent of the BoD and IEEE President is necessary to ensure a fair election process,

Be it resolved that the NPSS AdCom opposes the proposed changes and respectfully recommends creation of an independent EOC. The motion was moved and passed.

Our July AdCom meeting will be held on Saturday, 22 July in New Orleans following NSREC.

*Albe Larsen, IEEE NPSS Secretary and Newsletter Editor, can be reached by E-mail at [a.m.larsen@ieee.org](mailto:a.m.larsen@ieee.org).*

### NEW ADCOM MEMBERS



**Brendan B. Godfrey**  
AdCom 2020, PSAC

Brendan Godfrey has been a Visiting Senior Research Scientist at the University of Maryland since March 2010, and through the university served for two years as a half-time consultant to the Deputy Assistant Secretary of Defense for Research. In 2012 he became an Affiliate of LBNL. He retired from the Air Force early in 2010, after 21 years as an executive manager of its research programs. His assignments included Director of the Air Force Office of Scientific Research in Arlington, Virginia; Deputy Director of the 311<sup>th</sup> Human Systems Wing at Brooks City-Base, Texas; Director of Plans and Program at the Air Force Research Laboratory at Wright-Patterson AFB, Ohio; Director of the Armstrong Laboratory at Brooks AFB, Texas; Director of Advanced Weapons and Survivability at Phillips Laboratory; and Chief Scientist of the Air Force Weapons Laboratory, both at Kirtland AFB, New Mexico. Before that, he was Vice President and Regional Manager of Mission Research Corporation, Intense Particle Beam Group Leader at Los Alamos

National Laboratory, and a plasma scientist at Kirtland AFB. His personal research centers on computational plasma physics, intense microwave sources, and particle-beam acceleration and propagation. He is a Fellow of both IEEE and APS. He has received the Meritorious Executive Presidential Rank Award three times, among other federal recognitions. He holds a Ph.D. from Princeton University and a B.S. from the University of Minnesota.

Dr. Godfrey has been a member of the IEEE since 1976, and has served on the Plasma Science and Applications (PSAC) Executive Committee (ExCom) almost continuously since 1994, including twice as Vice-Chairperson and once as Chairperson. As Chairperson, he was an ex officio member of the Nuclear and Plasma Sciences Society (NPSS) Administrative Committee (AdCom) in 2011-2012. He became an appointed member of AdCom in 2014 and an elected member in 2015 and again in 2017. He maintains the comprehensive NPSS Directory of Plasma Conferences. Since 2011, he has been a member of the IEEE-USA Research and Development Policy Committee (R&D PC), appointed Vice-Chair in 2014 and Chair in 2016. As an R&D PC member, he has drafted several policy statements and letters, which have been adopted by IEEE-USA. He has given talks about IEEE-USA at NPSS conferences and management meetings. He has helped to organize several plasma conferences and has served on a number of state, local, university, and National Research Council advisory committees.

*Brendan Godfrey can be reached by phone at +1 281-778-1517 (home) and +1 832-808-0882 (cell) or by E-mail at [brendan.godfrey@ieee.org](mailto:brendan.godfrey@ieee.org).*



**Susanne Kuehn**  
Conferences Chair

Susanne Kuehn graduated in particle physics from the University of Freiburg, Germany.

She worked on data analysis of the ATLAS experiment and silicon detector development and research for particle physics experiments. Now, she is a staff physicist at CERN, Geneva, Switzerland. It is currently the world's largest particle accelerator lab and within the ATLAS experiment, she works on the upgrade of the silicon detectors and on R&D for future silicon detectors for particle tracking. In 2016 she was Deputy NSS Program Chair at the NSS-MIC Symposium and for several years she has been chair of the Conference Information and Promotion Committee of the NSS-MIC Symposium. In addition, she serves for the second time as a RISC member.

*Susanne Kuehn can be reached by E-mail at [Susanne.Kuehn@cern.ch](mailto:Susanne.Kuehn@cern.ch).*

### FOOD FOR THOUGHT

Earth provides enough to satisfy every man's need, but not every man's greed.

*Mahatma Gandhi*

## Technical Committees

### COMPUTER APPLICATIONS IN NUCLEAR AND PLASMA SCIENCES



**Martin Purschke**  
Chair, CANPS Technical Committee

In this issue we have the third installment of the articles by student award winners from the Padova Real-Time conference last year. Today you can read about the award-winning work by Sergio Esquembri from the Technical University of Madrid (UPM). For the past three years, Sergio has been a graduate student working in the Instrumentation and Applied Acoustics Research Group (I2A2) on image acquisition and processing systems for ITER, the magnetic confinement fusion device under construction in southern France. The group also collaborates with the Spanish Energy Research Center CIEMAT on several projects. Sergio and the I2A2 group have built a FPGA-based data-acquisition system to capture essential parameters of the ITER tokamak. Sergio received the student award for his paper "Real-time implementation in JET of the SPAD disruption predictor using MARTe."

*Martin Purschke, CANPS chair, can be reached by E-mail at [purschke@bnl.gov](mailto:purschke@bnl.gov) or by phone at +1 631-344-5244.*

### OUT OF SIGHT

Fanaticism consists of redoubling your efforts when you have forgotten your aim.

*George Santayana*

### NUCLEAR MEDICAL AND IMAGING SCIENCES



**Paul Marsden**  
NMISC Chair

As you read this newsletter the composition of the program for this year's 2017 IEEE NSS/MIC meeting at the Hyatt Regency in Atlanta, USA is well underway. The meeting will take place from the 21<sup>st</sup>–28<sup>th</sup> October. John Aarsvold (General Chair) along with Lars Furenlid and Matt Kupinski (MIC Program Chair and Deputy Program Chair respectively) will be working on the abstract review with the aim of producing an exciting program for this latest edition of the meeting. Further details can be found on the conference website <http://www.nss-mic.org/2017/>.

It is also at this time of the year when we are searching to replace five NMISC committee members by motivated volunteers to serve a three-year term starting from 01 January 2018. Self-nominations are encouraged. If you are interested in serving on the NMISC please contact the NMISC Secretary Emilie Roncali [eroncali@ucdavis.edu](mailto:eroncali@ucdavis.edu).

Nominations are now being solicited for this year's NMISC awards. The Edward J. Hoffman Medical Imaging Scientist Award is given annually to an individual in recognition of outstanding contributions to the field of medical imaging science. The Bruce Hasegawa Young Investigator Medical Imaging Science Award is also awarded annually to a young investigator in recognition of significant and/or innovative technical contributions made early in their

career. To be eligible for the Hasegawa award the individual must have been awarded their highest degree no more than six years prior to the date of nomination. I would like to take this opportunity to encourage all of you to nominate worthy colleagues for both these awards by the 15<sup>th</sup> of July deadline. All relevant information including the nomination form may be found on the NMISC website - <http://ieee-npsc.org/technical-committees/nuclear-medical-and-imaging-sciences/>. Please send your nominations to the NMISC Awards Chair, Dimitris Visvikis [Visvikis.Dimitris@univ-brest.fr](mailto:Visvikis.Dimitris@univ-brest.fr), using the nomination form on the website.

*Paul Marsden, Chair of the NMISC, can be reached by E-mail at [paul.marsden@kcl.ac.uk](mailto:paul.marsden@kcl.ac.uk).*

### PULSED POWER SCIENCE AND TECHNOLOGY



**Andreas Neuber**  
PPS&T Chair

### PPC CONFERENCE

The 21<sup>st</sup> Pulsed Power Conference is being held at the Hilton Metropole Hotel, in Brighton, UK, June 18<sup>th</sup>–22<sup>nd</sup>. Since its inception in 1976 in Lubbock, TX, the PPC will be held for the first time in its 50 year history outside the U.S.

The organizers are happy to announce that 460 abstracts have been received and an exciting technical program has been developed. It may be found online here <http://ece-events.unm.edu/ppc2017/program.html>. Also, as has become the custom, one of the highlights of this biennial meeting

is the recognition of distinguished members of our community through professional awards.

Dr. Ron Gilgenbach is the recipient of the Peter Haas Award. Dr. Gilgenbach is distinguished Professor and Chair of Nuclear Engineering and Radiological Sciences at the University of Michigan. During his 45 years in Plasma and Pulsed Power Science, most of them at the University of Michigan, he has supervised 48 graduated Ph.D. students. Many of these students have gone on to have significant careers in pulsed power in Academia, Industry and National Laboratories. Prof. Gilgenbach has made major contributions in the areas of electron- and ion-beam generation, 1 MA LTD driver technology, high-power microwaves, diagnostic development for pulsed-power-driven plasma environments and high-power microwaves and z-pinch physics. He has a long history of service to the IEEE and APS and is a fellow of both.

Dr. Sergei Rukin is the recipient of this year's Erwin Marx Award. Dr. Rukin is currently the Head of the Pulsed Power Laboratory of the Institute of Electrophysics, Russian Academy of Science, Ural division. He is recognized for his pioneering work in the discovery of nanosecond current cutoff in silicon semiconductors at high current densities known as the SOS effect. His technology has enabled fast repetition rate, high-power microwave generation, fast high-voltage switching and nanosecond megavolt pulse rise times (> 1MV/ns) for large pulse power. Dr. Rukin has authored and coauthored over 150 publications and 13 inventions.

Mr. David Yanuka is the recipient of this year's Arthur H. Guenther Pulsed Power Student Award. A student of Prof. Krasik, Mr. Yanuka is currently completing his Ph.D. research at the Technion, Israel Institute of Technology. He is recognized for his research on implosion of shock waves generated by underwater electrical explosion of wire arrays. Mr. Yanuka has published eleven coauthored journal papers with four of them as first author.

**PPS&T ELECTIONS**

The Pulsed Power Science and Technology (PPST) technical committee continues the transition to an elected committee. At the time this newsletter reaches the readership, we will be in the transition period between closing the nominations on June 1<sup>st</sup>, and opening the ballots for voting on July 31<sup>st</sup>. We consider it important for the future of pulsed power that we have a solid voting turn-out. Please support our excellent candidates with your vote. They are ready to volunteer their time so that we may be able to shape the future of the Pulsed Power Conference as well as other cosponsored conferences in the upcoming years. Ballots shall be distributed to the members of the Voting Community on July 31<sup>st</sup>, 2017 to fill the four member-at-large vacancies.

The Voting Community consists of persons who are IEEE NPSS members at the time of ballot distribution

and who have a vested interest in Pulsed Power Science & Technology as witnessed, for instance, by past participation in the IEEE International Pulsed Power Conferences. Individuals will be selected by majority vote. The four-year terms of office of elected members-at large shall begin January 1<sup>st</sup>, 2018. In general, the PPST Committee represents the interests of the pulsed-power community in the understanding, development and application of pulsed power to a variety of fields including but not limited to plasma physics, nuclear science, high-power RF, and life sciences. The constitution and bylaws for PPST may be found at the following link: [http://iee-npss.org/wp-content/uploads/2014/03/PPST\\_Constitution\\_July-19-2014.pdf](http://iee-npss.org/wp-content/uploads/2014/03/PPST_Constitution_July-19-2014.pdf).

*Andreas Neuber, Chair of the Pulsed Power Science and Technology Committee may be reached by E-mail at [Andreas.neuber@ttu.edu](mailto:Andreas.neuber@ttu.edu) or by phone at +1 806 834 8270.*

**RADIATION INSTRUMENTATION**



**Lorenzo Fabris**  
*RI Chair*

The Radiation Instrumentation Steering Committee serves the interests of the community members attending the Nuclear Science Symposium and Medical Imaging Conference. Every year, five of the fifteen elected positions on the RISC are up for election for a three-year term. The experience

of serving on the committee is both technically interesting and professionally fulfilling, providing an in-depth perspective on the inner workings of the conference, and giving our members a chance to work for the nuclear science instrumentation community. We are seeking candidates for this year's five elected positions, so if you or a colleague are interested in being involved at a higher level, please contact Patrick Le Dû [patrickledu@me.com](mailto:patrickledu@me.com) at your earliest convenience. More information on RISC, its composition and its mission is available at <http://iee-npss.org/technical-committees/radiation-instrumentation/>

*Lorenzo Fabris, Chair of the Radiation Instrumentation Steering Committee, can be reached by E-mail at [fabris@ornl.gov](mailto:fabris@ornl.gov) or by phone at +1 865-576-2474.*

**Functional Committees**

**AWARDS**

**2017 NPS Awards**



**Janet Barth**  
*IEEE NPSS Awards Committee Chair*

Each year the Awards Committee is tasked with selecting the recipients of our Society awards. They are for individuals who have shown outstanding dedication to the Society and who have made significant contributions to one or more of our fields. The young award recipients show strong early contributions in their technical areas or great promise in making contributions along their career paths. This is the first year that the Glenn F. Knoll Awards have been presented. We thank Gladys H. Knoll and Valentin T. Jordanov for their generous gifts to the IEEE Foundation, which make these awards for post doctoral and graduate education possible.

Our congratulations to all!

**MERIT AWARD**

**Ravi P. Joshi**



**Ravi P. Joshi**  
*2017 Merit Award Recipient*

Dr. Ravi P. Joshi received the B. Tech. and M. Tech. Degrees in Electrical Engineering from the Indian Institute of Technology in 1983 and 1985, respectively, and earned the Ph.D. degree in Electrical Engineering from Arizona State University. In

1989, he joined Old Dominion University where he was named a University Professor in 2007 and an Eminent Scholar in 2010. Since 2015, he has been a full Professor at Texas Tech University. He has mentored over 60 graduate students. Dr. Joshi has been involved in research related to Pulsed Power for over 27 years, broadly encompassing modeling and simulations of charge transport, bio-electrics and biomedical applications of Pulsed Power, and various nonequilibrium phenomena involving high electric fields. The latter included breakdown under pulsed-power conditions, streamer physics, simulation studies of relativistic magnetrons, and electro-thermal effects on explosive emission. He has used Monte Carlo methods for simulations of charge transport in solids, liquids, and gases; swarm physics including calculations of transport coefficients to test the accuracy of cross-sections; and electron transport in bio-molecular liquids. More recently he has begun to use atomistic Molecular Dynamics techniques to probe field-driven interaction phenomena at surfaces, including cell membrane poration and mass-ejection phenomena over ultrashort time scales at nanoemitters. Dr. Joshi has authored over 350 articles, including 165 refereed journal publications, and has given over 25 invited talks. He has been a visiting scientist at Oak Ridge National Laboratory, Philips Laboratory, Motorola, and NASA Goddard. He served as a Guest Editor for five Special Issues of the IEEE *Transactions on Plasma Science* in 2003, 2007, 2009, 2011, and 2014 and has been a reviewer for over 20 international academic peer-reviewed journals. In 2009, he was elevated to IEEE Fellow. In 2014, he became a Fellow of the Institute of Physics, the Institution of Engineering and Technology, and the Institution of Electronics and Telecommunication Engineers. To date, his publications have over 6,000 citations, with an h-index of 42 and i10-index of 114. Dr. Joshi has served as reviewer for the Air Force Office of Scientific Research, National Science Foundation, NSF I/UCRC, Israel Science Foundation, Agence Nationale Recherche (France's National Research Agency), and the Czech Science Foundation. He was part of the organizing committee of the 2010 IEEE International Conference on Plasma Science, Chair of the Publications and Publicity Committee for IEEE Conference on Electrical Insulation and Dielectric Phenomena in 2007 and 2008, and has served as an IEEE Distinguished Lecturer since 2014. He holds one patent.

*Jeff Cesario*

**US POOR LEMMINGS**

Those who profess to lead ... are simply the fastest runners and the loudest squeakers of the herd which is rushing blindly down to its destruction.

*Thomas Henry Huxley*

*Citation: For significant and sustained contributions to bioelectrics and physics-based understanding of high field phenomena in pulsed power applications.*

**RICHARD F. SHEA DISTINGUISHED MEMBER AWARD**

**Ronald M. Keyser**



**Ron Keyser**  
*2017 Shea Award Recipient*

Dr. Ron Keyser received his B.S., M.S., and Ph.D. degrees in Nuclear Physics and Mathematics from the University of Florida in 1965, 1967, and 1970, respectively. Later, he took additional course work in internal dosimetry and technical management. In 1971, he joined ORTEC in Oak Ridge, TN as the High Energy Physics Product Manager. He continued at ORTEC for over 40 years in a variety of positions, including software developer for embedded systems and spectroscopy data collection; Applications Laboratory Director; Software Development Manager; and ECAT PET control and data collection software developer. He managed the development of software for more than 25 commercial products and wrote the operating manuals and was the major contributor to the marketing materials for those products. In the early 1990s, he concentrated on testing low-background HPGe detectors and worked on IEEE and ANSI standards for characterizing these as a member of the N42 committee. He has taught the ORTEC-sponsored Gamma-Ray Spectroscopy and SNM analysis classes for many years and developed these into interactive, computer-based training classes. In 2005, Dr. Keyser worked on testing systems to detect nuclear smuggling, using both vehicle monitoring and handheld devices, and contributed to the design of software for the ORTEC systems. He is one of the awardees on the US patent for "zero-deadtime correction" in gamma-ray spectra collection. He was elevated to IEEE Fellow in 2011. When he retired in 2012, he and his wife, Merry, formed a consulting company to continue the training and authorship of articles. Dr. Keyser has been an IEEE NPSS volunteer for more than 30 years. He was the NPSS Committee Chair and a member of IEEE Standards and served on the Radiation Instrumentation and Nuclear Medical and Imaging Sciences steering committees. For most years from 2000 to 2017, he served as the Chair the Industrial Exhibit of the Nuclear Science Symposium (NSS) and Medical Imaging Conference (MIC), increasing the number of companies from

about 35 to over 80. He also served as the NSS/MIC General Chair in 2010 and the Conference Treasurer in 2008 and 2017. From 2011 through 2016, he was the NPSS Treasurer and is currently serving as the Assistant Treasurer. Throughout his years of service to the NPSS, he successfully promoted increased support for students to attend the NSS/MIC. Dr. Keyser is a member of IEEE (Life Fellow) and a member of the American Physical Society, Sigma Xi, ANSI (N42), and past member of the American Nuclear Society and the Institute of Nuclear Materials Management. He and Merry have two children and three grandchildren and enjoy travelling, both for the IEEE and to visit family.

*Citation: For outstanding contributions and leadership to the Nuclear and Plasma Sciences Society and IEEE as NPSS Treasurer, and for further contributions to the Radiation Instrumentation Technical Committee and NSS/MIC conference over many years.*

**EARLY ACHIEVEMENT AWARD**

**Chao Chang**



**Chao Chang**  
*2017 Early Achievement Award Recipient*

Dr. Chao Chang received B. Eng. and Ph. D. degrees from Tsinghua University, Beijing in 2006 and in 2010, respectively. He was a Research Associate at the SLAC National Accelerator Laboratory and Stanford University from 2011 to 2013. Presently, he is full professor at the Xi'an Jiao Tong University, Xi'an, China. He proposed and developed methods of multipactor suppression on windows and in dielectric-loaded accelerators and proposed a high-gain optical undulator for a free-electron laser (FEL). As the first and corresponding author, he has published more than 40 peer-reviewed journal papers and has authored 15 patents for his inventions. He received the IEEE Outstanding Student in Plasma Science Award in 2011 and was elevated to IEEE Senior Member in 2016.

*Citation: For contributions to optical and electromagnetic undulators for free electron lasers, and for studies of microwave window breakdown, multipactor suppression on windows and in dielectric-loaded accelerators, and high-power microwave devices.*

## Functional Committees Continued from PAGE 5

### CHARLES K. BIRDSALL AWARD

#### Alex Friedman



Alex Friedman  
2017 Charles K. Birdsall Award Recipient

Dr. Alex Friedman received his B.S. and Ph.D. degrees in Engineering Physics and Applied Physics, respectively, from Cornell University. After post-doctoral research with Professor Ned Birdsall at U.C. Berkeley from 1978 through 1980, he joined the staff of Lawrence Livermore National Laboratory (LLNL) where he has held research and leadership positions. He has also been an active Affiliate at Lawrence Berkeley National Laboratory (LBNL) for over twenty years. His career has included work on laser-driven inertial fusion, heavy-ion-driven inertial fusion, magnetically confined fusion, plasma physics, accelerator physics, computer simulation, numerical analysis, and other topics. He is known for the invention and development of simulation methods for plasmas and particle beams and was the originator of the open-source particle-in-cell simulation code Warp, which incorporates a number of novel methods. Following in Ned Birdsall's tradition, he has promoted the use of interactive and user-steerable simulations. From 1998 through 2015, he was the Theory and Simulations Group Leader for the Heavy Ion Fusion Science Virtual National Laboratory, a collaboration of LBNL, LLNL, and the Princeton Plasma Physics Laboratory (PPPL). He is currently serving as LLNL's Fusion Energy Sciences Program's Associate Program Leader for Simulations and Theory (primarily magnetic fusion). Dr. Friedman is a Fellow of the American Physical Society and a recipient of the LLNL Physics Department's Distinguished Achievement Award. He served as Associate Editor of the Journal of Computational Physics from 2003 through 2009. He has mentored a series of students and postdoctoral fellows, including co-mentoring with Ned Birdsall after moving to LLNL, and has authored or coauthored over 350 publications and reports.

**Citation:** For contributions to the science and practice of computational physics, including the development of novel methods and effective computer codes, and their application to fusion plasmas and particle beams.

### GLENN F. KNOLL POSTDOCTORAL EDUCATIONAL GRANT

#### Patricia Schuster



Patricia Schuster  
2017 Glenn F. Knoll Postdoctoral Education Grant Recipient

Dr. Patricia Schuster is a President's Postdoctoral Fellow in the University of Michigan Nuclear Engineering and Radiological Sciences department. She completed her Ph.D. at the University of California, Berkeley, where she studied radiation-detection materials and instrumentation for a broad range of nuclear security applications. Her dissertation research was performed at Sandia National Laboratories in Livermore, CA through

the Nuclear Science and Security Consortium. She has also studied nuclear security policy, including work on cross-domain deterrence as implemented historically by U.S. policy makers. Dr. Schuster's primary technical interests include the materials science and basic physics of neutron detectors, including organic scintillator materials. She also works on applications in arms control, nonproliferation, and emergency response and will use her Knoll Grant funds for the development of a radiation imaging system for arms control treaty verification.

### GLENN F. KNOLL GRADUATE EDUCATIONAL GRANT

#### Audrey Corbeil Therrien



Audrey Corbeil Therrien  
Glenn F. Knoll Graduate Education Grant Recipient

Audrey Corbeil Therrien completed her B.Appl. Sc. and her M.Appl.Sc. in Electrical Engineering at Université de Sherbrooke, Canada, in 2010 and 2013, respectively. In 2010 she received the Leonardo da Vinci Medal, the highest distinction given by the Engineering Faculty. She is currently pursuing a Ph.D. degree in Electrical Engineering under the supervision of Pr. Jean-François Pratte. Her research interests include the simulation and optimization of radiation detectors based on single-photon avalanche diodes (SPAD). In particular, she studied positron emission tomography detectors to determine the feasibility of achieving a time resolution of 10 ps. Most notably, she created a simulator to help in the design of SPAD-based detectors and readout electronics which is now available for everyone to use. Therrien was awarded the Paul Phelps Continuing Education grant to attend the 2011 IEEE Nuclear Science Symposium (NSS) and Medical Imaging Conference (MIC) and has won three prizes for student paper competitions, including best poster in the 2016 MIC student paper competition. In addition to her academic pursuits, she is strongly involved in promoting Science, Technology, Engineering and Mathematics (STEM) careers with local youth and is a member of the Conference Information and Promotion (CIP) committee for the NSS/MIC.

### GRADUATE SCHOLARSHIP AWARDS

#### Amanda Loveless

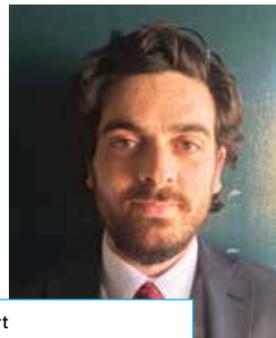


Amanda Loveless  
2017 Graduate Scholarship Award

Amanda Loveless is a graduate student in the School of Nuclear Engineering at Purdue University, where she is advised by Dr. Allen Garner, Assistant Professor of Nuclear Engineering. This Award is in recognition of her work in theoretical modeling of electrical breakdown in gases in microscale gaps. She performed a matched asymptotic analysis of a model unifying field emission with Townsend avalanche that matched simulation and experimental

results across a wide range of gap distances and pressures while quantitatively and analytically demonstrating the transition from field emission to the classical Paschen law. Her work demonstrates the fundamental physics in small scale devices that will aid researchers interested in either generating microplasmas or avoiding breakdown in micro- and nanoelectronics. Loveless' research is supported by a Junior Faculty Development Grant from the Nuclear Regulatory Commission. She also received the 2016-2017 Otto F. and Jenny H. Krauss Scholarship and the 2016-2017 IEEE Dielectric and Electrical Insulation Society Fellowship for her proposal on modeling RF breakdown.

#### Sabahattin C. Yurt



Sabahattin Yurt  
2017 Graduate Scholarship Award

Sabahattin C. Yurt received the B.S. degree in electrical and electronics engineering from Istanbul University, Istanbul, Turkey and the M.S. degree in electrical engineering from Istanbul Technical University, Istanbul, Turkey. He is currently completing his Ph.D. degree under the supervision of Professor Edl Schamiloglu at the University of New Mexico, Albuquerque, NM. His current research interests include high power microwave devices, microwave generation, metamaterials, periodic structures, BWOs, traveling wave tubes, and various microwave applications. He has accepted a position with Intel Corporation in Chandler, AZ beginning in the summer of 2017.

### RADIATION INSTRUMENTATION AWARDS: CALL FOR NOMINATIONS



Chiara Guazzoni  
RITC Awards Chair

In the March issue of the Newsletter you had the chance to read a report on the 2016 activities of the RISC Honors and Awards Subcommittee and on the RISC award ceremony held on October 31<sup>st</sup>, 2016 during the opening session of the 2016 IEEE Nuclear Science Symposium at the Palais de la Musique et des Congrès in Strasbourg (France).

It is now time to nominate a colleague (early career or senior) for the two prestigious awards that RISC will present in 2017: the Radiation Instrumentation Early Career Award (RIECA) and the Glenn F. Knoll Radiation Instrumentation Outstanding Achievement Award (RIOAA). The deadline for 2017 is July 15<sup>th</sup>. Before submitting a nomination, please consider that these are awards (prize in recognition of something that has been achieved) and not grants (financial support in view of something). Grants to attend the 2017 IEEE Nuclear Science Symposium and Medical Imaging Conference in Atlanta are available and the call is published on the conference website <http://www.nss-mic.org/2017/Awards.asp>.

The Radiation Instrumentation Early Career Award is given to a young investigator in recognition of significant and innovative technical contributions to the fields of radiation instrumentation and measurement techniques for ionizing radiation. The prize consists of \$1,500 and an engraved

plaque. The past recipients of the RIECA can be found on the Radiation Instrumentation Technical Committee (RITC) web page <http://iee-npss.org/technical-committees/radiation-instrumentation/>. The Committee for 2017 is being formed.

The prestigious Glenn F. Knoll Radiation Instrumentation Outstanding Achievement Award is given to an individual in recognition of outstanding and enduring contributions to the field of radiation instrumentation. The prize consists of \$3,000 and an engraved plaque. The past recipients of the RIOAA can be found on the RITC web page <http://iee-npss.org/technical-committees/radiation-instrumentation/>. The Committee for 2017 is being formed.

Nomination packets are available in doc and pdf formats on the RITC webpage <http://iee-npss.org/technical-committees/radiation-instrumentation/> and the completed packets should be submitted in pdf format via email to the Award Committee Chair Chiara Guazzoni [Chiara.Guazzoni@mi.infn.it](mailto:Chiara.Guazzoni@mi.infn.it). The nominator should provide the information requested on the nomination form. Please do not submit materials beyond those requested.

*Chiara Guazzoni, RITC Awards Chair, is with Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano and with INFN—Sezione di Milano, P.za Leonardo da Vinci, 32—20133 Milano—Italy, Phone: ++39 02 2399 6147—Fax: ++39 02 2399 3699, e-mail: Chiara.Guazzoni@mi.infn.it*

### CHAPTERS



Haidy M. abd el-Kader  
NPSS Alexandria Student Branch Chapter Secretary



Sherouk abd el-Ghany  
Author

Nuclear engineering is based on fundamental principles of physics and mathematics that describe nuclear interactions and the transport of neutrons and gamma rays, so the chapter was determined to present a crash course on vector calculus, named *Spotlight on Vector Calculus*. *Spotlight on Vector Calculus* aims to highlight basic concepts in vector calculus useful to nuclear engineering students and physics/engineering students in general. It starts with an introduction and motivation of introducing the idea of coordinates to solve geometric problems using the power of algebra, and ends up with different applications in physical problems governed by famous/different field equations. *Spotlight on Vector Calculus* aims at finding the patterns on which physical sciences are based. Familiarity with basic mathematical notations is one of its goals. The targeted audience was the students of the first, second, and third years. Engineer Hossam M. Farag, who is a senior student in the Nuclear and Radiological Engineering department and a volunteer in the chapter, was the instructor. The course took place in the Nuclear and Radiological Engineering department over five consecutive days.

**This course allows students to:**

- » Understand the concept of a field (scalar/vector) coupled with the continuum approximation and its application in physical problems.
- » Investigate the interrelation of Linear Algebra and Vector Analysis.
- » Be familiar with the concept of vectors as objects in space.
- » Understand the concept of the expansion (Linear Decomposition) of an object in terms of a complete set of basis vectors.
- » Investigate different commonly used orthogonal coordinate systems and Vector Linear Transformation.

- » Understand the nabla operator, its representation in different commonly used orthogonal coordinate systems and its applications in physical problems.
- » Be familiar with the basic tensor notation.

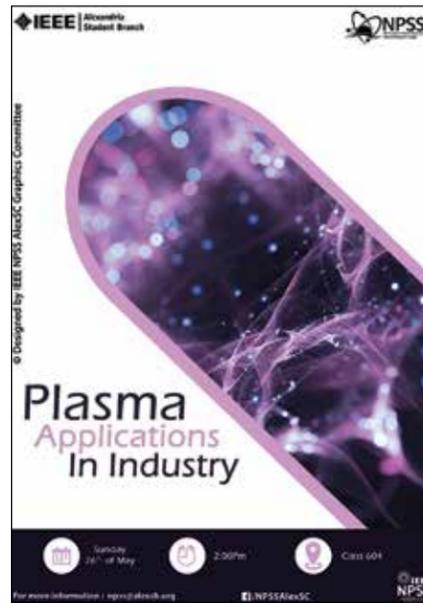
We also managed to organize a session on *Plasma Applications in Industry: Silicon Plasma Etching*, by Dr. Ali Abdou. Professor A. Abdou received a B.S. degree in nuclear engineering from the Alexandria University, Egypt in 1992, M.Sc. in Nuclear Engineering in 2002, M.Sc. in Computational Sciences in 2003 and Ph.D. in Nuclear Engineering in 2005 all from the University of Wisconsin Madison, USA. The session was presented as a webinar and it lasted for two hours. The plasma-etching technology requirements in the nanotechnology era was outlined from an industrial perspective.



Vector Calculus class.



Hossam M. Farag, a senior at Alexandria University, lecturer in Vector Calculus course.

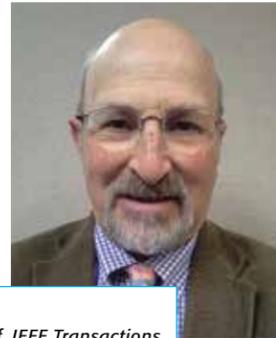
**Poster for Plasma Applications in Industry Seminar**

This report was prepared by Sherouk Abd el Ghany, a volunteer member of the R&P Committee.

*Haidy M. Abd el-Kader, Secretary of the Alexandria Student Branch Chapter can be reached by E-mail at [haidymohammed94@gmail.com](mailto:haidymohammed94@gmail.com).*

**PUBLICATIONS****IEEE Transactions on Plasma Science**

Report on Upcoming Special Issues



**Steve Gitomer**  
Editor-in-Chief, *IEEE Transactions on Plasma Science*

- » August 2017—Special Issue on Electrical Discharges in Vacuum—Senior Editor: (Ken Struve (Sandia National Laboratories, Albuquerque, NM USA); Guest Editors: Zongqian Shi (Xi'an Jiaotong University, Xi'an, China) & Erik Taylor (Siemens AG, Berlin, Germany) — Status: Submission deadline has passed, to be published August 2017

- » October 2017—Special Issue—Selected Papers from EAPPC/BEAMS/MEGAGAUSS 2016—Guest Editors: Joshua Leckbee (Sandia National Laboratories, Albuquerque, NM, USA), Fernando Silva (Instituto Superior Tecnico Universidade de Lisboa, Lisbon, Portugal), Hong-Je Ryou (Korea Electrotechnology Research Institute, Changwon, South Korea) & Jianqiang Yuan (Institute of Fluid Physics, Chinese Academy of Engineering Physics, Mianyang, China)—Submission deadline has passed, to be published October 2017

- » December 2017—Special Issue on Plasma Assisted Technologies—Guest Editor: Igor Matveev (Applied Plasma Technologies, Falls Church VA USA)—Status: Submission deadline has passed, to be published December 2017

- » April 2018—Special Issue on Plenary and Invited papers from ICOPS-2017—Co-Guest Editors: TBD [derived from the 44<sup>th</sup> International Conference on Plasma Science—21-25 May 2017, Atlantic City, NJ, contacts are Jose L Lopez [jose.lopez1@shu.edu](mailto:jose.lopez1@shu.edu); WeiDong Zhu [wzhu@saintpeters.edu](mailto:wzhu@saintpeters.edu), web page: <http://www.shu.edu/international-conference-plasma-science/>—Submission deadline 01 September 2017, to be published April 2018

- » April 2018—Special Issue of Selected Papers from SOFE '17—Acting Senior Editor: Elizabeth Surrey (UKAEA); Guest Editors: William Cary (General Atomics), Irving Zatz (PPPL), Paul Humrickhouse (INL), Dennis Youchison (ORNL) & Yuhu Zhai (PPPL); derived from 27<sup>th</sup> IEEE Symposium On Fusion Engineering; 4–8 June 2017; Shanghai Marriott Hotel City Centre, Shanghai, China—Submission deadline 08 June 2017, to be published April 2018

- » April 2018—Special Issue on Dusty Plasmas—Senior Editor: Truell Hyde (Baylor University, Waco, TX, USA); Guest Editors: Peter Hartmann (Research Institute for Solid State Physics and Optics, Budapest, Hungary) and Jirka Pavlu (Charles University, Prague, Czech Republic) [derived from 8<sup>th</sup> International Conference on the Physics of Dusty Plasmas, May 20–25, 2017, Prague, Czech Republic]—Submission deadline 30 June 2017, to be published April 2018

- » June 2018—Special Issue on High Power Microwave Generation—Senior Editor: Don Shiffler (Air Force Research Laboratory, Kirtland, NM, USA); Guest Editors: Brooke Stutzman (US Coast Guard Academy, New London, CT, USA), Jim Browning (Boise State University, Boise, ID, USA), Julie Lawrence (Air Force Research Laboratory, Kirtland, NM, USA), Wenlong He (University of Strathclyde, Glasgow, UK)—Submission deadline 15 October 2017, to be published June 2018

**Articles****Contributions to JET's Disruption Prediction System**

**Sergio Esquembri,**  
Graduate Student Award Author

Nuclear fusion experiments are being performed all over the world. There are several approaches followed by the different fusion research centers. ITER, the experiment that is expected to be the first fusion device to produce net energy, has been

designed following a standard tokamak configuration. ITER is a international project funded and run in a collaboration of the European Union, India, Japan, China, Russia, South Korea, and the United States. ITER is still under construction, and its closest reference is JET, the world's biggest tokamak in operation. JET is a European project located in Oxfordshire, United Kingdom.

Plasma disruptions are one of the major problems relating to stable tokamak operation Plasma disruptions [1] are violent events that release the plasma stored energy in a short period of time, producing large thermal loads, strong electromagnetic forces, and runaway electrons that can severely damage the machine. At present, plasma disruptions in tokamaks can not be prevented. Only through mitigation techniques can

the machine be saved from the detrimental effects of these disruptions. These mitigation techniques need to be applied with some lead time prior to the disruption to be fully effective. This leads to the need for accurate and reliable disruption predictors able to foresee the disruptions with enough anticipation time. The reliability of these predictors is not only measured in terms of the successful detection rate but also of the false alarm rate, as the mitigation techniques will terminate the plasma even if the disruption was a false positive.

Regarding plasma disruption predictors in JET, only two types are currently implemented: the ones based on threshold crossing detection and the *Advanced Predictor Of DISruptions* (APODIS), based on so-called Support Vector Machines (SVM). The first ones trigger an alarm when a signal related to plasma instabilities exceeds a certain threshold. The threshold is set manually for each signal in each discharge, and is more or less restrictive depending on the potential damage of a possible disruption. This method could lead to missing the disruption or detecting it too late if the threshold was set too low or might trigger a false alarm if the threshold was too restrictive. The other predictor, APODIS, is based on the Support Vector Machine approach. This method

requires the training of the predictor with the signals from an extensive set of discharges. In the case of APODIS, the predictor was trained using seven signals from almost 10,000 JET discharges, which took more than 900 hours on a high-performance computer. With this training the predictor is able to split the plasma operational space represented by the input signals into safe or disruptive, giving better results than the threshold predictors.

Recently, a new type of predictor was implemented and integrated in the JET real-time system. The Single signal Predictor based on Anomaly Detection (SPAD)[2], formerly known as PBOD (Predictor based on Outlier Detection)[3], aims to predict disruptions based on the abnormal behavior of a signal. The prediction is done without training the algorithm or changing a threshold value between discharges. SPAD uses one of the signals also present in the JET threshold disruption predictors, the locked mode (LM) signal. SPAD samples the LM signal at a frequency of 1 kHz, and processes the last 32 samples acquired every 2 ms. The new predictor uses the time and frequency information of the LM signal obtained by means of a mathematic

## Articles Continued from PAGE 7

transformation that produces eight coefficients (the approximation coefficients of the level 2 Haar Wavelet Transform). The analysis of JET discharges reveals that if one views these coefficients as a feature vector in a multidimensional parameter space, they form a compact cluster that denotes the area of safe discharges or the safe periods of a discharge. In contrast, outliers appear before a disruption occurs. This behavior is clearly visible in the reduction of the data to two coefficients as shown in Figure 1. The next step in detecting an outlier is to measure the distance between a given feature vector and the cluster formed by all the previous feature vectors. Taking into account the distribution of the samples in the cluster, the Mahalanobis distance proved to be more effective for detecting an outlier. The formula (1) is then applied to obtain a factor (OF) determining how anomalous the measured distance (DM[k]) is compared to all the distances calculated so far (DM[0..k-1]). Tests show a high probability of disruption when this value exceeds 10. The detection results of SPAD are compared with

APODIS and the threshold predictor using the LM signal in Table 1.

Table 1:

Predictor	False Alarms	Missed Alarms	Tardy Detections	Valid Alarms	Premature Alarms
SPAD	7.42 %	10.60 %	3.18 %	83.57 %	2.65 %
APODIS	<5 %	15.38 %	2.47 %	79.15 %	3.00 %
LMPT	---	30.39 %	3.00 %	63.69 %	2.65 %

$$O_F = \left| \frac{D_M[k] - \mu(D_M[0..k-1])}{\sigma(D_M[0..k-1])} \right|$$

SPAD is implemented using MARTE[4], the framework used in JET for the development of real-time applications. After its offline validation when SPAD was fed with recorded data from JET past discharges, SPAD is currently running as part of JET's real-time systems, processing the discharge data in real-time. There is still room for improvements. One of the possible improvements is to identify the root cause of false alarms and try to reduce their number. The possibility of applying this process to other signals of the LM, together or separately, is

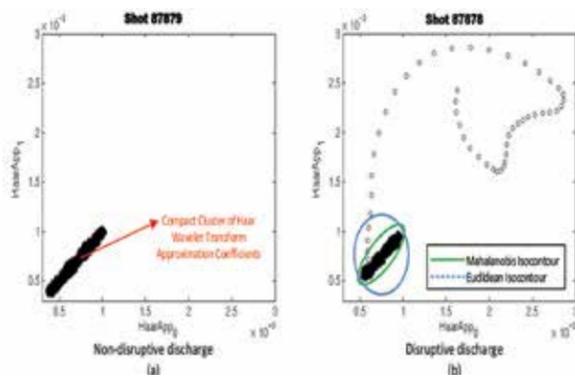


Fig. 1 Representation of the coefficients used by SPAD algorithm for non-disruptive (a) and disruptive (b) discharges. The figures show wavelet transformation level 4 applied to Locked Mode signal sampled at 1 kHz in 32 sample windows updated every 2 ms. Due to the covariance among the members of the cluster, the outliers can be detected using the Mahalanobis distance.

being evaluated. We also study the possibility to dynamically determine the optimal value for the outlier factor during the discharge.

## REFERENCES

- [1] L. E. Zakharov et al, "Understanding disruptions in tokamaks a," *Phys Plasmas*, vol. 19, pp. 055703, 2012.
- [2] S. Esquembri et al, "Real-time implementation in JET of the SPAD disruption predictor using MARTE,"

*IEEE Trans. Nucl. Sci.*, Under review, submitted June 2016.

[3] J. Vega et al, "Advanced disruption predictor based on the locked mode signal: Application to jet," in *Proceedings of the 1st EPS Conference on Plasma Diagnostics (ECPD2015)*, 14-17 April 2015, Frascati, Italy. Online at <https://pos.sissa.it/cgi-bin/Reader/Conf.Cgi?confid=240>, Id. 28, 2015, pp. 28.

[4] A. C. Neto et al, "MARTE: a multiplatform real-time framework," *IEEE Trans. Nucl. Sci.*, *IEEE Transactions On*, vol. 57, pp. 479-486, 2010.



# STUDENT VIDEO COMPETITION

00:00:00:00

The Nuclear and Plasma Sciences Society is soliciting videos for a student video competition.

The video shall be no more than two minutes long and shall be based on the importance and relevance of NPSS to the student. For example, the video might show the relevance of specific NPSS technology to his/her work or might be a demonstration and explanation of an NPSS technology. The video copyright must be assigned to IEEE.

Contributions are due by 15 December 2017 and shall be emailed to Peter Clout at [clout@vista-control.com](mailto:clout@vista-control.com).

The videos will be used on the NPSS web site, at NPSS conferences between sessions, at the

Membership table, and elsewhere as NPSS deems appropriate.

### PRIZES

FIRST PRIZE: Up to \$2500 to attend the NPSS conference of his or her choice, plus IEEE certificate

SECOND PRIZE: 128 GB iPad Pro (\$700) or gift certificate of equivalent value plus IEEE certificate

THIRD PRIZE: \$250 gift card plus IEEE certificate

All IEEE NPSS student members are welcome to participate!

### ADCOM OFFICERS 2016

President: Stefan Ritt  
 Vice President: Ron Schrimpf  
 Treasurer: Ralf Engels  
 Assistant Treasurer: Ron Keyser  
 Secretary, Albe Larsen

### ADCOM CLASS OF 2020

Christian Bohm, (TNC)  
 Brendan Godfrey, (PSAC)  
 Vesna Sossi, (NMISC)

### ADCOM CLASS OF 2019

Monica Blank (PSAC)  
 Bryan Oliver (PPST)  
 Ron Schrimpf (RE)  
 Dennis Youchison (Fusion)

### ADCOM CLASS OF 2018

Paul Lecoq (RI)  
 Steven McClure (RE)  
 Steve Meikle (NMISC)  
 Stephen Milton (PAST)

### ADCOM CLASS OF 2017

Steve Gold (PSAC)  
 Dave Hiemstra (RE)  
 Weihua Jiang (PPST)  
 Dick Lanza (RI)  
 Martin Grossmann CANPS

### TECHNICAL COMMITTEE CHAIRS

Fulvia Pilat (PAST)  
 Allan Johnston (RE)  
 Lorenzo Fabris (RI)  
 Paul Marsden (NMISC)  
 Andreas Neuber (PPST)  
 Charles Neumeyer (Fusion)  
 Martin Purschke (CANPS)  
 Michael Kong (PSAC)

### FUNCTIONAL COMMITTEE CHAIRS

Janet Barth (Awards)  
 Peter Clout (Communications)  
 Steve Gold (Chapters and Local Activities)  
 Susanne Kuehn (Conferences)  
 Dan Fleetwood (Distinguished Lecturers)  
 Christian Bohm (Transnational)  
 Christoph Ilgner (Young Professionals)  
 Jane Lehr (Fellow Evaluation)  
 Sal Portillo (Membership)  
 Paul Dressendorfer (Publications)  
 John Verboncoeur (Nominations)

### LIAISONS

Lee Berry (Coalition for Plasma Science)  
 Stan Schriber (PAC OC; APS-DPB)  
 Ray Larsen (SSIT, SIGHT, IEEE Smart Village)  
 Brendan Godfrey (IEEE-USA R&D Policy)  
 Michael King (TMI)  
 Suleman Surti (TMI)  
 Cinzia Da Via (Women in Engineering)  
 Heiko Koerte (Industry)  
 Edl Schamiloglu (Educational Activities Board)  
 Harold Flescher (RADECS)

### NEWSLETTER EDITOR:

Albe Dawson Larsen  
 E-mail: [a.m.larsen@ieee.org](mailto:a.m.larsen@ieee.org)

### EDITOR EMERITUS:

W. Kenneth Dawson  
 E-mail: [k.dawson@ieee.org](mailto:k.dawson@ieee.org)

### CONTRIBUTORS LISTED ALPHABETICALLY:

Janet Barth, Chao Chang, W. Kenneth Dawson, Sherouk abd el-Ghany, Haidy M. abd el-Kader, Sergio Esquembri, Lorenzo Fabris, Teresa Farris, Alex Friedman, Steve Gitomer, Brendan Godfrey, Susanne Kuehn, Chiara Guazzoni, Ravi P. Joshi, Ron Keyser, Albe Larsen, Patrick Le Dû, Amanda Loveless, Paul Marsden, Andreas Neuber, Martin Purschke, Stefan Ritt, Patricia Schuster, Audrey Corbell Therrien, Sabahattan Yurt.

©2017 IEEE. Information contained in this newsletter may be copied without permission provided that the copies are not made or distributed for direct commercial advantage, and the publication title and date appear.

### CONTRIBUTED ARTICLES

Publicity releases for forthcoming meetings, items of interest from local chapters, committee reports, announcements, awards, or other materials requiring society publicity or relevant to NPSS should be submitted to the Newsletter Editor by July 5<sup>th</sup>, 2017 for publication in the September 2017 Newsletter.

News articles are actively solicited from contributing editors, particularly related to important R&D activities, significant industrial applications, early reports on technical breakthroughs, accomplishments at the big laboratories and similar subjects. The various *Transactions*, of course, deal with formal treatment in depth of technical subjects. News articles should have an element of general interest or contribute to a general understanding of technical problems or fields of technical interest or could be assessments of important ongoing technical endeavors.

Advice on possible authors or offers of such articles are invited by the editor.