



President's Report: The Future of the IEEE

The upcoming IEEE election (15-Aug through 03-Oct) includes an IEEE Constitutional Amendment proposal that could change the nature of the IEEE. Learn about the pros and cons, opportunities and risks, and the alarming process issues that have limited open discussion.



John Verboncouer
IEEE NPSS President

NPSS CONFERENCES

I am writing this on the flight back from a chain of travels that included two NPSS conferences. I had the pleasure to attend the International Conference on Plasma Science (ICOPS) in Banff, Alberta, Canada, followed shortly after by the International Power Modulator and High Voltage Conference (IPMHVC) in San Francisco, California, USA.

ICOPS, in its second visit to Banff this century, was well organized, and provided exciting technical sessions inside, and amazing vistas outside during the rare lull in activity. As a hidden blessing, I stayed

at the far end of Banff since the lodging filled up, and enjoyed a vigorous 20-minute walk each way under towering mountains capped with bits of clinging snow. I had the distinct honor of awarding the inaugural 2015 Charles K. Birdsall Award to Mark Kushner of the University of Michigan during a plenary session, and the 2016 Charles K Birdsall Award to John Cary of the University of Colorado-Boulder/TechX Corporation at the Awards Banquet later that evening. Charles "Ned" Birdsall would have been so proud to have the first two awards go to such luminaries in modeling, and both with strong records of propagating the knowledge widely in conferences such as ICOPS.

The IPMHVC is technically cosponsored by NPSS, and financially sponsored by our sister society Dielectrics and Electrical Insulation Society (DEIS). Given the similarity of topic areas, it is not surprising that many NPSS members are regular attendees of the IPMHVC and also members of DEIS, and indeed our members have a very strong role in the technical program. San Francisco was wonderful as always, with food that rivals the great Asian and European cities.

IEEE CONSTITUTIONAL AMENDMENT AND IEEE IN 2030

Now we get to the main event. The IEEE vote for the Amendment and President-elect are scheduled to run from 15th August to 3rd October, while NPSS elections opened on 2nd August. This election will be exceptionally important, as it could change the very nature of the IEEE, including the way societies such as NPSS operate.

As I mentioned in recent newsletter reports, an effort to change the governance structure of the IEEE is underway, led by the IEEEin2030 committee. This has many in the IEEE alarmed that society representation at the highest levels of the IEEE may be in jeopardy. I see some intriguing opportunities in some of the proposed elements of restructuring, but have become gravely concerned about the means by which it is being pursued, in a fashion that suppresses discussion and quashes dissent in a very non-IEEE fashion. I will explain.

At the Feb-2016 Technical Activities Board (TAB) meeting, where all the society and council presidents and division directors meet to discuss common issues of IEEE societies and councils, TAB Vice President Jose' Moura created an Ad Hoc Committee, called TABin2030, to study the effects of the proposed governance changes, and appointed me Chair. TABin2030 has held several

PRESIDENT'S REPORT Continued on **PAGE 2**

SOCIETY GENERAL BUSINESS

President's Report	1
Proposed Constitutional Ammendment	2
Pro	2
Con	3
Secretary's Report	3

CONFERENCES

2016 NSS/MIC/RTSD	4
2017 ICOPS	6
2017 Pulsed Power	7
2017 NSREC	7

TECHNICAL COMMITTEES

Computer Applications in Nuclear and Plasma Sciences	8
Fusion Technology	9
Pulsed Power Science and Technology	9

FUNCTIONAL COMMITTEES

Awards	9
Chapters	11
Publications	11

LIAISON REPORTS

EAB Education	12
Coalition for Plasma Science	12

ARTICLES

Positron Emission Tomography: Current Status of Motion Correction	13
Plasma's Effects on Cancer	14

President's Report Continued from PAGE 1

webinars (recorded and viewable here: <http://ta.ieee.org/strategic-planning/tab-in-2030>) to discuss the Constitutional Amendment appearing on the ballot, and the proposals for changing the structural governance of the IEEE. Much of that is covered in my last report.

To summarize, the TABin2030 determined that the Constitutional Amendment is incomplete without the accompanying Bylaw changes that will follow. Key definitions of the Board of Directors (BoD), the legal controlling body of the IEEE, are eliminated from the Constitution and will be modified later in Bylaws to be brought forward in the near future. Note that the Constitution is owned by the members, and requires a 2/3 vote of at least 10% of eligible voting members to change. It is intended to safeguard the fundamental nature of the IEEE. Both TABin2030, and many other bodies including IEEEin2030, agree that those safeguards are weak and risks exist in the present Constitution, and TABin2030 concluded that those risks are increased by the Constitutional Amendment. Instead, TABin2030 suggests that strengthening the fundamentals in the Constitution would be a better course of action.

If key definitions of the BoD are moved to the Bylaws, this will take them out of the members' hands, as changes to the Bylaws can be made by a 2/3 vote of the BoD, with no notification to members until after the change is made. While that is perfectly reasonable for housekeeping changes, member and broad leadership involvement in fundamental structural changes seems important for a robust IEEE.

Proponents say the Constitutional Amendment will increase the member voice; how is that consistent? Proponents are referring to the ability to better distribute geographic representation without increasing the size of the BoD using the representative Assembly, which serves primarily in an advisory capacity to the BoD. Proponents also view IEEE-wide election of directors as increased member voice, although any given voter is unlikely to know much about the character and leadership style by looking at summary biographies. Furthermore, slates of candidates selected by a nomination and appointment process overseen by the BoD may lead to selection of compliant and like-minded individuals for the slate, offering little choice. Given that the Executive Director would also become a nonvoting ex-officio member of the BoD, the ED would quickly become the most senior member of the BoD since (s)he would be the only director with a term longer than two years (or three, in the current proposed modified Bylaws). This could change

the fundamental nature of the IEEE as a volunteer member-governed organization, coupled with the control of the nomination process that controls the slates for new directors.

A new Enterprise Board will handle fiscal operations, where Societies and Councils will have one vote out of seven on fiscal matters despite generating 75-80% of the IEEE revenue. The Enterprise Board is overseen by the BoD, which could have zero directors drawn from the Societies and Councils that understand the conference and publication business model that generates most of the IEEE revenue. This could lead to a substantial change in the fiscal operation of the IEEE, and for societies and councils in particular.

I see both risks and opportunities in the Constitutional Amendment and subsequent structural governance changes. I would rather see significant protections for member control of the IEEE enshrined in the Constitution, with implementation details in the Bylaws. I think these are points of discussion for reasonable people, but we should not accept concentration of all power without checks and balances. Given that the ultimate governance structure enabled by the Amendment is still subject to change, and is outside the control of both members and society and council leadership, this introduces substantial risk, and is a change that may be very hard to undo if the result is not acceptable to members. It would be far better to vote on a package of changes that includes a clearly articulated final state for the governance, so that we know exactly what we are voting for.

Separately from the substance of the Constitutional Amendment and subsequent structural governance changes, the process being pursued in the election has alarmed many of us who see the IEEE as a democratic and egalitarian professional society built around respect for open debate and examination of evidence. Indeed, this is even captured explicitly in IEEE Policy 13.3.A.2:

It is the policy of IEEE to facilitate open discussion, including opposing views, of issues and initiatives to appear on the ballot (Constitutional amendment and referendum); this applies to those proposals originated by the IEEE Board of Directors as well as those of other members of IEEE.

This would seem to apply quite clearly to matters of governance, including the upcoming ballot item on the IEEE Constitutional Amendment. Nevertheless, in 2015 the BoD created an Ad Hoc committee

called the Election Oversight Committee (EOC), for the apparent purpose of providing advice to the IEEE President on election processes. The current (2016) IEEE President was the Chair of the IEEEin2030 in 2015, which proposed the Constitutional Amendment to both the Governance Committee and the BoD for endorsement in Nov-2015. Contrary to the claim that the Amendment and the IEEEin2030 governance changes are separate efforts pursued by separate bodies, the former is a precondition for the latter developed and proposed (see the BoD minutes from Nov-2015) by the IEEEin2030 Chair. Remarkably, the Executive Director, who stands to become an ex-officio nonvoting member of the BoD if the Amendment passes, was appointed to chair the Teller's Committee that counted the votes. In my line of work, that is called Conflict of Interest, and indeed the IEEE training materials posit the same.

The IEEE Bylaws allow for opposition statements on initiative ballots, and a number of IEEE members stepped forward to offer carefully crafted statements of their concerns. Staff and the EOC edited the statements, including removing coauthors, stripping author titles, and even editing the text of the statements substantially. The appeals process goes through the President, who added additional edits, serving as the adjudicator for a matter in which he was the chief proponent as chair of the committee proposing the Amendment. IEEE Legal, the IEEE officers, and others have been unable to answer the simple question of what governance policy authorizes the specific actions of censorship, and why a participant also serving as the adjudicator does not have conflict of interest. While I presume that the proponents sincerely believe they are working in the best interests of the IEEE, frustration at years of failure to convince the rest of IEEE of the value of the proposed changes has led to a mentality of winning at all costs that allows the ends to justify the means. This is not the IEEE many of us have worked so hard to build, and if this is an indicator of the sort of judgment we can expect in a more executive-style IEEE, it is a deal breaker for me.

Many of us have been receiving frequent admonitions against "electioneering" from the IEEE President and IEEE Legal Counsel, which in normal cases would prohibit an incumbent from using the resources of the IEEE, such as IEEE mailing lists, to gain an unfair advantage over someone without access. In this context, the electioneering missives appear to be attempts to intimidate us into not speaking out on the proposed Constitutional Amendment and subsequent governance changes. I note that they do NOT seem to apply to those speaking in favor. As you can see from my NPSS Newsletter Reports over the past year, I disagree strongly with the attempts to suppress discussion,

and have now been joined by most other Society and Council Presidents.

Of Society and Council governing bodies taking a position, 24 out of 25 oppose the Constitutional Amendment. The NPSS AdCom is scheduled to discuss this at the upcoming AdCom meeting, and if that is beyond the time to press for this Newsletter, we will inform members via email of any actions taken on this important and time-sensitive matter. You should take this issue very seriously, and decide what kind of IEEE you want, while it still lies in the hands of the members.

RESOURCES:

The IEEE governing documents, including the Constitution and Bylaws, can be found here: <http://www.ieee.org/about/corporate/governance/index.html>.

The proposed changes to the Constitution can be found here: https://www.ieee.org/about/corporate/election/2016_constitutional_amendment.html

The TABin2030 documents and webinars can be found here: <http://ta.ieee.org/strategic-planning/tab-in-2030>

Materials on the IEEEin2030 effort to evolve the IEEE organizational structure can be found here: https://www.ieee.org/about/corporate/ieeein2030_archive_m.html

Materials from the opposition can be found here: <https://iee2016blog.wordpress.com/>

The IEEE belongs to its members, and you should play a role in re-engineering it. IEEE elections typically are determined by about 15% of the members, so about 60,000 members may vote in this election, and a few hundred votes may make the difference. Your vote really counts, so please vote!



John Verboncoeur, NPSS President
John Verboncoeur, IEEE NPSS President, can be reached at johnv@msu.edu

I know of no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them but to inform their discretion.

Thomas Jefferson

Proposed IEEE Constitutional Amendment

Below are statements in favor and opposed to this proposed amendment

Pro: In favor of the Constitutional Amendment
William W. Moses, IEEE Fellow and IEEE NPSS Conferences Chairman

MY CONSTITUTIONAL JOURNEY

In late 2014, an invitation to join a committee to determine what IEEE needed to do to serve its members in 2030 started me on a constitutional journey. Despite my extreme skepticism about strategic planning, I was intrigued by how IEEE might look in 2030 and so agreed to participate. The committee's main recommendation was to restructure the top level of IEEE governance (essentially the Board of Directors or BoD), and

I was subsequently asked to help propose a governance structure. I had a lot of misgivings, as I knew that five other attempts to transform the BoD had been made in the last two decades. Each attempt took an enormous amount of effort to create, faced stiff resistance, and was defeated in the end, with its proponents (figuratively) left beaten, bloodied, and exhausted. I also knew that any change in governance structure would involve some organizational risk. But having attended over a dozen BoD meetings, I felt there was considerable room for improvement, and the continued attempts to transform the BoD suggested fundamental problems. So I agreed to serve.

Eighteen months later, my views regarding IEEE's future have changed considerably. I started out complacent about IEEE's direction and now have significant reservations. In short, I think that IEEE's current focus on fundamental research precludes its full participation in the global technology boom, and that IEEE faces significant challenges whether it keeps or expands its present focus.

In more detail, IEEE began with an emphasis on industry but has morphed into an organization centered on fundamental research. Our main activities (conferences and archival publications) are research oriented, our major revenue generating products (these same conferences and publications) serve the research market, and the "day jobs" of our leaders are predominantly in fundamental research. During the roughly 30 years since I first became involved with IEEE, this research sector has been healthy and grown at a rate comparable to the cost of living, and by virtually any measure IEEE has grown at a similar rate.



William W. Moses
IEEE Fellow and IEEE NPSS Conferences Chairman

By contrast, the industry side of the electrical engineering world has exploded. Thirty years ago, many of today's dominant technology companies, such as Apple, Microsoft, Google, Amazon, Cisco,

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and Intel, didn't exist or were operating out of garages. The growth rate of the industrial sector and the number of electrical engineers employed by it has vastly outstripped that of the fundamental research area, but only a small percentage of these people interact with IEEE. This point was brought home to me during an Industry Outreach program in Silicon Valley where I spent nearly a week exploring potential connections to IEEE with over 100 engineers. These people are very intelligent, technically excellent, innovative, inventive, driven to succeed, generally between ages 20 and 40, and should be part of the IEEE family. But we heard over and over again that IEEE did not provide much that they valued, and when asked to describe IEEE in one word, one replied, "Obsolete." Ouch!!! Clearly, IEEE is not supporting the careers of all electrical engineers, and as engineering careers increasingly span both academia and industry, we should provide our members with connections and resources wherever their careers take them.

Moreover, changes are coming to IEEE whether we want them to or not. Nearly half of IEEE's revenue currently comes from the sale of research publications, but the world is evolving toward a place where publications are free. Unless we find alternate sources of revenue, we will be forced to re-evaluate our involvement in humanitarian activities, education, public policy, and other areas that require financial support. The number of communities within IEEE is growing rapidly as the number of new and cross-disciplinary technologies increases, putting tremendous stress on our present governance approach that gives each recognized community a voting seat on some governance body. We already have difficulty accommodating growth in the research sector alone (TAB has grown from 54 to 64 voting members in the last 20 years), and it will be difficult to provide this kind of representation in an ever-evolving landscape with hundreds, perhaps even thousands, of different communities whose needs must be met. In addition, our membership is aging. Over the last decade, the age of the average IEEE member has risen from 45 to 48 years old: if this trend continues, IEEE could easily fade into irrelevance.

Embracing the tech industry could help IEEE to meet some of these challenges but would require significant outreach. We would need to incorporate people from these communities into our leadership, so that IEEE can understand how to make IEEE attractive to the electrical engineers working in industry. This would, however, exacerbate our current governance structure's representational challenges.

So what does this have to do with the proposed changes to the IEEE constitution? In a nutshell, the proposed changes are designed to create a more

strategically oriented governance structure that is flexible enough to enable IEEE to adapt as the electrical engineering world evolves. At a very high level, the existing BoD is constituency based—seats are allocated to specific "operating units" within IEEE and each BoD member also heads one of those operating units. This causes several problems: 1) it reinforces the status quo, as there is no place on the BoD for new or emerging communities, 2) individual Directors face conflicts, as the best interests of IEEE as a whole don't necessarily match the best interests of a Director's operating unit, 3) the BoD meetings tend to focus on operations instead of strategy, and 4) to both be a BoD member and head an operating unit requires a huge time commitment (each position takes ~2 months / year). In the proposed structure, the heads of the operating units would not be BoD members. The operating unit heads would continue to be selected as they are presently, but BoD members would be selected based on individual skills and diversities and would not have other significant IEEE duties. In addition, the leaders of the six major boards within IEEE (Technical Activities, Membership and Geographic Activities, Standards, Publication Services and Products, Education, and IEEE-USA) would form a new body known as the Enterprise Board. This new body would be responsible for IEEE operations, leaving the BoD free to focus on strategy, and would also provide a forum that does not exist today for these six major boards to interact. A vote for the constitutional amendment would allow (but not require) these governance changes to be made, while a vote against would preserve the present structure.

So what are my thoughts as I complete my constitutional journey? First, I encourage members to take advantage of the copious information disseminated about the constitutional amendment and other governance changes as they decide how to vote. All changes involve risks, and much has been said elsewhere about those associated with changing IEEE's governance structure. But keeping our present governance structure also involves risks, as it is comparatively inflexible and so less able to adapt as the world changes. The financial, representational, and demographic challenges on the horizon require this kind of adaptability.

Finally, I believe that the IEEE will need to change, regardless of the outcome of this vote. While it is tempting to look for villains within IEEE who are disrupting the status quo, this need for change is driven by external forces that IEEE cannot control. IEEE must consciously decide which sectors of electrical engineering it wants to serve and develop strategies to serve all those sectors effectively. Assimilating people from all those communities as integral parts of IEEE's leadership structure is a

critical step toward accomplishing this. We must find a way to efficiently incorporate the rapidly growing number of different technical communities into our governance structure, especially if we increase our footprint in the tech industry. Finally, we have to give our younger members more leadership opportunities within IEEE, as they have the largest stake in figuring out how to make IEEE relevant in 2030.

Con: Opposed to the Constitutional Amendment



Harold L. Flescher
IEEE Fellow and IEEE NPSS
Finance Chair

I have had NPSS Finance Chair reports in the last two NPSS Newsletters explaining that the IEEE Ballot that comes out in August contains an Amendment to the IEEE Constitution that I feel you must disapprove, as it would create an IEEE environment that would financially disadvantage NPSS and the other 38 Technical Societies and 7 Technical Councils as well as our Member and Geographic Activities (MGA). I read something just a few days ago that was the output of a group of senior IEEE volunteers including me and several past IEEE Presidents and many past IEEE volunteers holding Director and Director-level volunteer positions. We as a group oppose the direction IEEE is being taken by our current volunteer leadership including our current Board of Directors. I thought it useful if you read the collective output of this group (**the loyal opposition**), which includes:

John Vig—past IEEE President

Charles Alexander—past IEEE President

Troy Nagle—past IEEE President

Marc Apter—past IEEE-USA President, past VP Regional Activities (MGA)

Tony Ivanov—Washington, DC Section Chair

Rabab Ward—President, IEEE Signal Processing Society

Harold Flescher—past IEEE Director, past IEEE VP Technical Activities, past IEEE Treasurer, past NPSS President

WHY MANY OPPOSE THE PROPOSED IEEE CONSTITUTIONAL AMENDMENT

...because the 2016 amendment, up for ballot starting August 15th:

- » Would enable a small group to take control of IEEE,
- » Would move vital parts of the constitution to the bylaws - which will be subject to change by a small group, on short notice,
- » Would transfer power from over 300,000 members to a possibly small group of insiders,
- » Would remove regional representation from the Board of Directors thereby making it possible that no Asian, European, Latin American or Canadian representatives will be on the Board of Directors,
- » Would remove technical activities representation from the Board of Directors thereby making it possible for a small group of bureaucrats and professional managers to take control of IEEE.

The possible benefits of the amendment do not outweigh its risks.

The existing IEEE constitution offers alternative, less complex ways of accomplishing the intended improvements, while maintaining members at the core of the decision-making process.

Additional reasons for opposing the constitutional amendment and proposed restructuring may be found here: <https://ieee2016blog.wordpress.com>

The proposed changes to the Constitution can be found here:

https://www.ieee.org/about/corporate/election/2016_constitutional_amendment.html

Please share this with other IEEE members you know. And PLEASE VOTE. We need fewer than 20,000 IEEE members to vote no to defeat this IEEE Constitutional amendment.

https://www.ieee.org/documents/ieee_board_of_directors_statement_opposition_rebuttals.pdf

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NOT CHANGE

Good things, when short, are twice as good.
Baltasar Gracian

Secretary's Report

The IEEE NPSS AdCom met in Portland, Oregon on Saturday, July 16th.

The most significant action of this meeting was the passage of the following motion:

» NPSS opposes the constitutional amendments proposed by the IEEE Board of Directors (BoD) because of the potential deleterious consequences:

Because bylaw changes are not yet defined, the effect of approving the Constitutional Amendment is unknown

Based on available information, representation on the new BoD by the societies will go from the current 11 of 31 members to a number that might be zero. All is unknown as the bylaws are not yet complete.

Based on available information, the budget process run by the IEEE Operational Finance Committee will report in through the new Enterprise Board, on which Technical Activities will have but one vote of 6-8 members. They will also control the split of IEEE revenues, ~80% of which is today earned by the Technical Societies from their products. How much we will have to support our NPSS activities is unknown.

See pro/con discussion at <http://ta.ieee.org/strategic-planning/tab-in-2030>.

Additional actions of AdCom include the following:

» NPSS approves budgeting of \$517,000 for the initiatives discussed during the Treasurer's Report.

These initiatives include support for our new journal, for our Young Professionals program, for child care grants and for an education program operated through the IEEE Foundation Smart Village program.

» NPSS will increase the funding for Women in Engineering events at NPSS conferences up to an additional \$1,500/event. These additional funds are to be used to support travel for speakers from outside of the conference community.

The NPSS will fund one travel grant per year (up to \$3,000/year) for the years 2017-2019 for a NPSS/WIE member to attend the Women in Engineering International Leadership Conference. The NPSS Awards Chair will administer the grant.

The NPSS Publications committee has chosen Dr. Dimitris Visvikis, University of Brest, France, as Editor-in-chief of our new journal, *Transactions on Radiation and Plasma Medical Sciences*, and the Steering Committee has been appointed. The first issue of the journal is expected in January. Watch our website for paper submission information. Papers from the 2016 MIC to be held in early November, will now, if a peer-reviewed publication is desired, be submitted here.

NPSS's treasurer reports that we are financially sound, but conferences need to work toward closing in a more timely way



Albe Larsen
IEEE NPSS Secretary
and Newsletter Editor

Our 2016 conferences are doing well and because of the number being held in Europe, a second set of booth materials will be generated. There is also a request for a set for China.

AdCom will meet again on Nov. 5th, 2016 in Strasbourg, France.

LIKE HACKERS

Some people are so busy learning the tricks of the trade that they never learn the trade.

Vernon Law

2016 IEEE Nuclear Science Symposium and Medical Imaging Conference

23rd Symposium on Room Temperature X-Ray and Gamma-Ray Semiconductor Detectors



STRASBOURG CONVENTION CENTER

(Palais De La Musique Et Des Congrès)

Strasbourg, France

29th October–6th November, 2016

www.nss-mic.org/2016

nssmic2016@ieee.org

Dear Colleagues,

The Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), together with the 23rd International Symposium on Room-Temperature Semiconductor Detectors (RTSD), is one of the leading annual international events that brings together scientific communities involved in the development of instrumentation for nuclear science (e.g., particle and nuclear physics, astrophysics, nuclear reactor instrumentation) and medical fields (e.g., biomedical imaging, multimodality and hybrid imaging), as well as national and international security and environmental sciences. This interdisciplinary event also offers an excellent opportunity for students and young professionals to meet and exchange their expertise and ideas with eminent scientists in their respective fields. Added emphasis will be placed on the interdisciplinary aspects of the various topics, as well as the technology transfer between fundamental research and relevant industrial and medical applications.



Maxim Titov
General Chair

This annual international congress typically attracts 2000 participants from around the world. This year, the 2016 NSS/MIC will be held at the Strasbourg Convention Center (Strasbourg, France) from 29 October to 6 November. The organization of this event is supported by the Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA), Institut National de Physique Nucléaire, et de Physique des Particules (IN2P3) of the Centre National de la Recherche et de Scientifique (CNRS), and the Institut National de la Santé et de la Recherche Médicale (INSERM). In addition, many European and American scientific communities active in the disciplines covered by the conference are contributing to its organization.

All presentations are eligible for publication in the Conference Record that will subsequently be made available in the Xplore IEEE Digital Library. In addition, authors may also elect to submit their manuscripts to the IEEE *Transactions on Nuclear Science* (TNS) or the new IEEE *Transactions on Radiation and Plasma Medical Sciences* (TRPMS). These peer-reviewed journals provide significant visibility and impact within the nuclear science and medical imaging communities.

The NSS/MIC and RTSD programs will include:

- » Short Courses and Tutorials presented by leading scientists
- » Scientific contributions organized into plenary sessions, parallel oral topical sessions, and poster sessions
- » Topical Workshops on emerging topics and new technologies in innovative fields
- » An industrial exhibit with associated technical presentations
- » Special events: WIE (Women in Engineering), YP (Young Professionals).
- » Technical visits to local research laboratories (e.g., IRCAD, IHU Strasbourg)

Together, the NSS/MIC and RTSD cover a broad range of applications in detectors and instrumentation across many fields. The scope of the programs attract worldwide experts from various communities—academic institutions, government laboratories, and industry—to exchange and identify new scientific and technical issues and challenges for the present and future. We have received 1570 abstracts, indicating an anticipated attendance of approximately 2000 participants.



Patrick Le Dù
Deputy General Chair

Complete, updated information is available on the conference website: www.nss-mic.org/2016

General Chair

Maxim Titov (CEA Saclay, IRFU, France)

Deputy General Chair

Patrick Le Dù (CNRS IPN, Lyon)

Conference Coordinator

Dora Merelli (CEA Saclay, IRFU, France)

Local Arrangements Chair

Anthony Lavietes (IAEA, Vienna, Austria)

European Coordinator

Marc Winter (CNRS/IN2P3/IRES, Strasbourg, France)

The conference includes three primary scientific and technical programs:

Nuclear Science Symposium (NSS)

For scientists and engineers alike, this program encompasses the latest developments in instrumentation and data processing in the fields of particle and nuclear physics, astrophysics, space science, security, energy and environmental sciences, and radiation therapy. The program spans a wide spectrum of techniques from small, single-channel detectors to large, complex detection and analysis systems.

The NSS program format consists of plenary, parallel, and poster sessions. In addition to the primary session topics listed below, joint sessions will be held with the MIC and RTSD communities on dosimetry, beam instrumentation, and hadron therapy. These joint sessions are intended to highlight similar research activities among the three communities. The NSS received a total of 814 high-quality abstract submissions, from which 336 oral and 420 poster presentations were selected.



Dora Merelli
Conference Coordinator

NSS Topics

- » Accelerator technologies and beam-line instrumentation
- » Advanced computing and software for experiments
- » Astrophysics and space instrumentation
- » Calorimetry
- » Circuits for readout and triggering
- » Data acquisition, trigger, and analysis
- » Gaseous detectors
- » High-energy-physics instrumentation: large- and small-scale facilities
- » Instrumentation for experimental reactors and nuclear power plants
- » Instrumentation for security
- » Neutron detectors and instrumentation
- » New concepts in solid-state detectors and radiation damage effects
- » Nuclear physics instrumentation
- » Photodetectors
- » Simulation and prototyping for detector development
- » Scintillators and Scintillation Detectors
- » Synchrotron radiation and FEL instrumentation



Anthony Lavietes
Local Arrangements Chair



Marc Winter
European Coordinator

In keeping with the initiative of last year, we will hold a closing plenary session followed by an NSS Social Hour on Friday.

This year, we will break from tradition and, following the first day of plenary, oral, and poster sessions (Monday) we will hold an NSS dinner (rather than the traditional NSS luncheon). The NSS Dinner will take place at the beautiful Pavillon Joséphine Orangerie.

NSS Program Chair

Eckhard Elsen (CERN–Switzerland)

NSS Deputy Program Chair

Susanne Kuehn (Albert-Ludwigs-University Freiburg, Germany)



Eckhard Elsen
NSS Program Chair



Susanne Kuehn
NSS Deputy Program Chair

MEDICAL IMAGING CONFERENCE (MIC)

The MIC is a unique international scientific meeting on the physics, engineering, and mathematical aspects of nuclear medical imaging. The meeting will take place within the context of an increasing interest in multimodality approaches, both in terms of development of integrated multimodality imaging devices, as well as in unique software developments in image reconstruction and processing, making use of synergies associated with the combination of functional and anatomical imaging modalities and beyond. In parallel, developments in radiotherapy instrumentation and associated treatment and dosimetry protocols, including the combination of imaging and radiation therapy, are continuously gaining ground. The contents of this MIC meeting will therefore reflect the expanding areas of hardware and software developments both in multimodality imaging and radiation therapy through a number of specialized topics. The MIC program format consists

of oral and poster sessions. In addition, joint sessions will be held with the NSS and RTSD communities on dosimetry, counting photon detectors/spectral CT, and hadron therapy, to highlight research works in specific areas. Regular sessions will be complemented by Short Courses covering many different imaging and therapy aspects. The MIC received 559 high-quality abstract submissions, from which 114 oral and 370 poster presentations were selected.

MIC Program Topics

- » New radiation detectors/technologies for medical imaging
- » Preclinical (small animal) emission or multimodality imaging systems (design, instrumentation, performance)
- » Clinical emission or multimodality imaging systems (design, instrumentation, performance)
- » Application-specific (e.g., brain, breast, intra-operative) emission or multimodality imaging systems (design, instrumentation, and performance)
- » CT imaging technologies (hardware and software)
- » Other imaging technologies (e.g., optical, MR)
- Quantitative imaging techniques and data correction
- » Assessment and comparison of image quality and methods
- » Tomographic image-reconstruction techniques
- » Signal processing and image analysis
- » Parametric imaging and tracer kinetic modeling methods
- » Simulation and modeling for medical imaging and radiotherapy applications
- » Radiotherapy techniques and applications (e.g., image guided, dosimetry)

MIC Program Chair—Dimitris Visvikis (INSERM, UMR 1101, LaTIM, Brest, France)

MIC Deputy Program Chair—Suleman Surti (University of Pennsylvania, Philadelphia, USA)



Dimitris Visvikis
MIC Program Chair



Suleman Surti
MIC Deputy Program Chair

23RD INTERNATIONAL SYMPOSIUM ON ROOM-TEMPERATURE SEMICONDUCTOR DETECTORS (RTSD)

The RTSD represents the largest forum of scientists and engineers developing improved semiconductor radiation detectors and imaging arrays. Room-

temperature solid-state radiation detectors for X-ray, gamma-ray, and neutron radiation are increasingly finding applications in several diverse fields, such as medicine, homeland security, astrophysics, and environmental remediation. The objective of this symposium is to provide a forum for discussion of the state-of-the-art in the development of photoconductive materials for radiation detection, material and detector characterization, device fabrication processes, electronics, and applications. Oral and poster presentations have been organized to represent a broad spectrum of research activities emphasizing either device or material understanding. The RTSD received 156 high quality abstracts submissions, from which 94 Oral and 59 Posters presentations were selected.



Michael Fiederle
RTSD Cochair



Ralph James
RTSD Cochair

RTSD Program Cochair

Ralph James (Brookhaven National Laboratory, USA)

RTSD Program Cochair

Michael Fiederle (University of Freiburg, Germany)

RTSD Program Topics

- » 3d photon tracking detectors and image reconstruction technology
- » Pixel, strip, frisch-grid, co-planar grid, and discrete semiconductor detectors
- » Detector/asic hybridization, interconnects, and electronics
- » Semiconductor materials for radiation detection
- » Organic and other photoconductive materials for radiation detection
- » Properties of electrical contacts and device fabrication technology
- » Polarization, long-term stability, and radiation damage
- » Scintillator/semiconductor hybrid detectors with focus on semiconductor technology
- » Solid-state neutron detectors
- » Spectrometer systems for homeland security, nuclear inspections, safeguards, and portal monitoring
- » Imaging systems for medical, space, non-destructive testing, and cargo monitoring

NSS-MIC-RTSD Joint Sessions

Two Joint Sessions that address areas of common interest within the NSS, MIC, and RTSD communities have been organized for 2 November (Wednesday). These sessions are an opportunity to highlight transverse research work pursued across the respective fields. Abstract submissions that are of common interest to the NSS/MIC/RTSD communities have been specifically selected for

these joint sessions. This year, the joint sessions will focus primarily on dosimetry, hadron therapy, and photon-counting detectors.

Joint Session Topics

- » Multimodality approaches
- » Front-end electronics, signal digitization and processing
- » Beam instrumentation
- » New detector developments
- » Scintillators and photodetectors
- » Semiconductor-based imaging systems
- » Simulation, modeling and hybrid computing

Joint Session Program Chair

David Brasse
(IPHC IN2P3-CNRS –Strasbourg University)

Short Course Program

Whether you want to update your skills, boost your career, delve into a new field, or just refresh your memory, the IEEE Short Course Program can help you along your way. Learn from experts who have both theoretical knowledge and real-world practical experience in courses available in a wide range of topics for professionals in the nuclear science and medical imaging fields. All courses are one or two days in length and include a continental breakfast, lunch, and coffee breaks, as well as lecture notes and a certification of completion as part of the course registration fee.

Short Course Schedule

Dates: 29th October–1st November 2016

- SC1—Neutron Detection
- SC2—Integrated Circuits for Detector Signal Processing
- SC3—Advanced Photodetectors
- SC4—Room Temperature Semiconductor Detectors: Materials, Crystal Growth, and Technology
- SC5—Medical Image Reconstruction
- SC6—Image Quality and Statistical Analysis
- SC7—Biology for Imaging Scientists

Short Course Cochair

Silvia Dalla Torre (INFN-Sezione di Trieste—Italy)

Short Course Cochair

Youngho Seo
(University of California, San Francisco—USA)

Workshops

We invite you to join us for three interesting and exciting workshops at this year's NSS/MIC conference on Sunday, with two on 30th October 2016 and one on Friday, 3rd November 2016.

30th October (Sunday)

- » WS1—Workshop on Instrumentation and Measurement in Nuclear Environments (Reactors, Fuel Cycles and Safeguards)

As entitled, this workshop focuses on research, development and innovation in the frame of instrumentation and measurement dealing with nuclear experimental reactors such as ZPR (Zero Power Reactors), MTR (Material Testing Reactors), reactor demonstration prototypes for future nuclear power reactor/fission and fusion (e.g., GEN IV, ITER), as well as nuclear power reactors and the nuclear

fuel cycle, safeguards and homeland security, and radioactive waste management.

- » WS2—Workshop on Detectors for Ultra-Rare Event Processes

The second workshop on Sunday will focus on detectors for ultra-rare event processes, including Dark Matter detectors, neutrino detectors (including neutrino-less double beta decay), and the use of noble liquid scintillators and associated photosensors in search of other types of rare particles or decay signatures. It will be geared towards the non-expert and serve in part as an introduction to the topics of the third workshop—Technology Frontier for Single Photon Detection and Fast Scintillator Timing.

Friday, 4th November

- » WS3—Workshop on the Technology Frontier for Single-Photon Detection and Advanced Scintillator Timing

The overall focus of this workshop is on cutting-edge technologies addressing the issues that currently limit the use of single-photon detectors including, in particular, large-area readout issues, ultra-fast timing (better than 100 ps), radiation hardness, and Ultra-Violet and Vacuum Ultra-Violet sensitivity. The technologies that are of particular interest include analog SiPMs, SiPMs with embedded digital electronics (monolithic digital SiPMs, 3D-integration, etc.), as well as nonsolid-state-based solutions such as Micro-Channel plates, hybrid photodetectors or gas-based solutions. Scintillation materials and readout electronics solutions are also included as a part of the workshop scope.

This workshop aims at bringing together scholars, industry leaders and visionaries from across the world to discuss how academia and industry can partner to address these challenges. It represents a technical revolution with profound impact on feasible applications in particle physics, accelerator and nuclear physics, medical and biological imaging, nondestructive industrial processing and electronic design topics.

We encourage everyone who is interested in these topics to attend any or all of the workshops and bring in new ideas for discussion. Anyone interested in submitting a contribution to one or more of the workshops should use the normal conference paper submission link. Please contact the organizers listed in the workshop descriptions if you have any questions or wish to inquire further about the workshops.

Workshops Chair

Craig Woody (Brookhaven National Laboratory, USA)

Industrial Program

Attendees are invited to visit the exhibition area to see the latest in exhibitor offerings, as well as to attend the series of technical seminars focused on the newest product developments. The Industrial Exhibition will be located in a newly constructed, modern Exhibition Hall (Hall Rhin). All general conference coffee breaks will take place in the exhibition area and, in addition, the Attendee Lounge will be collocated with the exhibits. This is the ideal setup to maximize interactions between attendees and exhibitors. To allow the NSS, MIC, and RTSD communities ample time to visit the exhibition area, the exhibits will be open from Tuesday lunch time to the end of the afternoon coffee break on Thursday. The Exhibitors' Reception—another great opportunity to network with exhibitors—will be held on Tuesday night.

Exhibitor Technical Seminars

Do not miss the opportunity to attend the Exhibitor Technical Sessions. Held in parallel with the Industrial Exhibition, each technical session will provide a detailed view into emerging technology

Conferences Continued from PAGE 5

developments and recent new offerings directly from the manufacturers.

Academia-Industry Matching Forum

For the first time this year, academia will reveal cutting-edge technologies with potential benefits to your specific interests. Meet and talk with leading academic researchers who will present mature technology developments at this forum organized by HEPTech—the technology transfer network of particle, astro-particle, and nuclear physics. This event will take place concurrently with the conference and will provide additional networking opportunities.

Exhibits Reception

This informal event will be held on the evening of 1st November (Tuesday) in the Exhibition area to allow ample time for attendees and exhibitors to meet and discuss topics of mutual interest with no overlap with the scientific programs.

Exhibitor Chair

Jean Marie Legoff (CERN)

Exhibitor Cochair

Antonio Pacheco (CERN)

GRANTS AND AWARDS

Generous donations from individuals, institutions, agencies, and companies provide for a variety of financial support opportunities to attend the NSS/MIC conference or short-course program. Several IEEE awards are also available. The specific application deadlines and requirements can be found on the conference website (www.nss-mic.org/2016). All applications and recommendations must be submitted online.

Grants and Awards

- » 2016 NPSS Child Care Assistance Grant
- » 2016 Paul Phelps Continuing Education Grant
- » 2016 Conference Trainee Grants
- » 2016 Valentin T. Jordanov Radiation Instrumentation Travel Grant
- » 2016 NPSS Student Paper Awards
- » 2016 Radiation Instrumentation Early Career Award (NSS)
- » 2016 Glenn F. Knoll Radiation Instrumentation Outstanding Achievement Award (NSS)
- » 2016 Bruce H. Hasegawa Young Investigator Medical Imaging Science Award (MIC)
- » 2016 Edward J. Hoffman Medical Imaging Scientist Award (MIC)

Scholarship Chair—Merry Keyser

PUBLICATIONS

All manuscripts presented at the conference, both oral and poster, will be included in the Conference Record and distributed to all conference attendees. The Conference Record will subsequently be made available through IEEE Xplore. Authors may also elect to submit their manuscripts to one of the peer-reviewed journals—IEEE *Transactions on Nuclear Science* (TNS) or IEEE *Transactions on Radiation and Plasma Medical Sciences* (TRPMS). As IEEE publication rules have recently been revised, please visit the conference website (www.nss-mic.org/2016) for the latest details about publishing your manuscript.

Publication Chair—Cinzia Da Vià (University of Manchester, UK)

SOCIAL EVENTS

A number of entertaining and exciting social activities, as well as events and meetings on unique topics, will be offered throughout the week of the conference. Some require payment of a fee and others are complimentary. The following events are planned for the various conference Programs—individual detailed descriptions can be found on the conference website (www.nss-mic.org/2016).

NSS Dinner

**Monday, 31st October 2016,
19:00-22:00, Pavillon Joséphine**

This event has traditionally been held as a lunch, but this year it will transition to a dinner to be held in this unique location. Transportation will be provided.

MIC Dinner

**Friday, 4th November 2016,
19:00-23:30, Palais Universitaire**

The MIC Dinner will continue in its tradition as a dinner, with the current plans for an elegant event at this remarkable location. Transportation will be provided.

RTSD Luncheon

**Tuesday, 1st November 2016,
11:15-15:00**

A one-hour cruise around Strasbourg followed by a lunch at the famous restaurant, Maison Kammerzell, with a view of the Cathedral (Cathédrale Notre Dame de Strasbourg).

Exhibitors' Reception

**Tuesday, 1st November 2016,
19:00-21:00, Hall Rhin,
Strasbourg Congress Center**

There will be an exhibitor-sponsored reception on Tuesday evening for all attendees and their companions. This is a great opportunity to meet with representatives from the industrial exhibition in a casual atmosphere. Light refreshments will be served.

Conference Reception

**Wednesday, 2nd November 2016,
19:00-22:00, Strasbourg Congress Center**

Join us for the Conference Reception on Wednesday evening. This complimentary event will feature dinner and entertainment for all attendees and their companions. Enjoy the relaxing and fun atmosphere while meeting with other colleagues and making new friends.

Women In Engineering (WIE)

This year, the WIE event will take place on Thursday, 3rd November, during the lunch period. There will be three eminent speakers who will address issues related to their experience in the academic and entrepreneurial work environment. The final speaker will present her study on the psychological impact of women working in a male-dominated environment. A light refreshment will be included.

Young Professionals Reception

This annual event will meet on Thursday evening, 3rd November, at the Strasbourg Hilton Hotel (across from the Strasbourg Congress Center) from 19:00–21:00.

Technical visit to IRCAD and Institut hospitalo-universitaire de Strasbourg

**Wednesday, 2nd November 2016,
14:00-17:00**

In 1992, surgery faced inevitable changes, shifting from the industrial era to the computer era. In this context, Prof. Jacques Marescaux came up with the idea to create a unique research and training center. In 1994, IRCAD opened on the grounds of the University Hospital of Strasbourg. Since its creation, IRCAD has become world renowned as a leading research and education institute. In 2001, Professor Marescaux electrified the surgical world with "Operation Lindbergh." Sitting at a robotic console in New York City, Professor Marescaux dexterously removed the diseased gallbladder of a patient in Strasbourg, France—the perfect blending of information technology and surgery. Just as Lindbergh's solo flight across the Atlantic revolutionized our thinking, so did this worldwide first, proving that distances were no longer an obstacle in surgery. A visit to this state-of-the-art facility has been organized; the number of places is limited.

Excursion Program

Alsace, the region of which Strasbourg is the capital, runs west to east from the Vosges mountains through some of the most beautiful vineyards in France, to the mighty Rhine River and the border with Germany. Changing hands several times over the centuries between France and Germany has only strengthened the independent character of this fiercely traditional region.

Our Excursion Program will give you the opportunity to discover a little bit of this magical region, as well as give you an insight to Strasbourg, its traditional heritage, and its modernity. An exceptional offer of two classes with a famous French "pâtissier" complete our offer of excursions, all of them designed for both attendees and their companions.

All excursions will depart from the Leicester Room in the Convention Center. All full-day excursions include lunch in a local restaurant.

Excursion List

Companion Program Chair: Martine Oger (CEA IRFU/SPP Saclay)

- » E1 - Oberrhein and Wine Tasting
Sunday, 30th October—14:00-17:00
- » E2 - Baden-Baden (Germany)
Monday, 31st October - 09:00-17:00
- » E3 - North of Alsace, Betschdorf and Laliq Museum
Tuesday, 1st November - 09:00-17:00
- » E4 - Pedestrian Tour of Strasbourg (and Lunch)
Wednesday, 2nd November - 09:00–14:00
- » E5 - Pâtisserie!
Wednesday, 2nd November —14:30–17:30
Thursday, 3rd November —14:30–17:30

2016 NORTH AMERICAN PAC—NA-PAC 2016

**October 9th–14th, 2016
Chicago, IL**

Preparations for NA-PAC16 (9th–14th October) are proceeding well. We look forward to a very exciting and informative conference, beginning with IEEE Short Courses on Sunday morning October 9th and the special student poster session that afternoon. There will be lab tours of Argonne and Fermilab accelerator facilities on October 15th following the conference.

Please visit our website <https://napac2016.aps.anl.gov/> for the most up-to-date conference information, links to registration, scientific program, and paper submission.

Marion White, Conference Chair, can be reached by E-mail at mwhite@aps.anl.gov.

- » E6 - Strasbourg—Boat Tour and European Parliament Thursday, 3rd November—14:00–17:00
- » E7 - Colmar and Ribeauvillé
Friday, 4th November - 09:00–17:00
- » E8 - Haut-Koenigsbourg Castle, Wine Tasting and Lunch in Riquewihr Saturday, 5th November - 09:00–17:00

Companion Program Chair

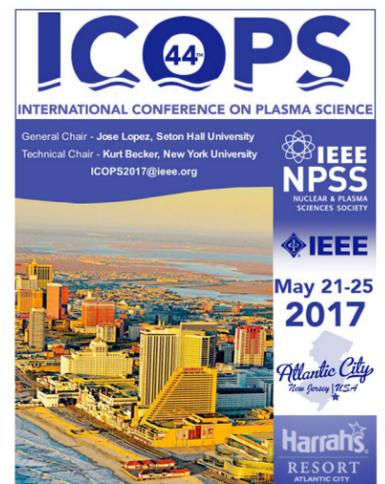
Martine Oger (CEA IRFU/SPP Saclay)

INTERNATIONAL CONFERENCE ON PLASMA SCIENCE

May 21st–25th, 2017

Atlantic City, New Jersey

The 44th annual International Conference on Plasma Science (ICOPS) will be held May 21st–25th, 2017, at the Harrah's Resort Atlantic City in Atlantic City, New Jersey. This conference continues the great tradition of excellence established by the prior conferences in the series. The organizational



committee has worked hard to offer, as usual, an outstanding technical program. Engineers and scientists from around the world conducting research and with interest in plasma science will attend ICOPS 2017. The technical and social programs have been organized to optimize opportunities for knowledge exchange and networking in the various areas of plasma science.

Professor Jose L. Lopez of Seton Hall University is the Conference General Chair. The Technical Program Chair, Professor Kurt H. Becker of New York University, and the Technical Area Chairs have assembled an outstanding program of contributed papers that are arranged in seven sessions of oral and poster presentations. The first technical area in Fundamental Research and Basic Processes in Fully and Partially Ionized Plasmas is chaired by Professor Weidong Zhu of Saint Peter's University. Sarita Devi Prasad from the University of New Mexico, is the technical area chair of Microwave Generation and Plasma Interactions. The technical area chair of Charged Particle Beams and Sources is Evgeniya Lock of the U.S. Naval Research Laboratory. The fourth technical area is in High Energy Density Plasmas and Applications which is chaired by Christine Coverdale of Sandia National Laboratories. The Industrial, Commercial, and Medical Applications technical area is chaired by Gregory Fridman of Drexel University. Achim von Keudell of Ruhr University Bochum (Germany) is the technical area chair of Plasma Diagnostics. The seventh technical area in Pulsed Power and other Plasma Application is chaired by Tao Shao of the Chinese Academy of Sciences. All contributed papers in the seven technical areas at ICOPS 2017 are eligible for submission and review for publication after the conference in IEEE *Transactions on Plasma Science*.

The conference will also include a Young Professionals session and a Women in Engineering event. Further, there will be an Industrial and Commercial Exhibit throughout the duration of the conference to allow attendees to learn about and discuss new developments in products, equipment, and services either enhanced by plasma science or of benefit to the plasma research community.

Professor Sung-o Kim of New York Institute of Technology is the Sponsors and Exhibits Chair. For more information on exhibits or conference sponsorship please visit <http://www.shu.edu/ICOPS2017> or contact Sung-o Kim at +1 516-686-1302 or sok@nyit.edu.

Atlantic City is a world-renowned travel destination with many resorts and attractions. Furthermore, it is a distinctive and popular destination for conferences and special events. Atlantic City, in the state of New Jersey on the Atlantic coast of the United States, is in close proximity to the New York City, Philadelphia, and Washington D.C. metropolitan areas where a third of the population of the United States lives. Atlantic City is approximately 60 miles (90 km) from Philadelphia, 125 miles (200 km) from New York City and 175 miles (280 km) from Washington, D.C. Conveniently, Atlantic City is served by the Atlantic City International Airport along with Philadelphia International Airport, approximately 65 mi or 105 km, and Newark Liberty International Airport, approximately 116 mi or 187 km away from Atlantic City. In addition, Atlantic City has train service connections from all major East Coast cities.

The ICOPS 2017 will be held at the Harrah's Resort Atlantic City which has over 2500 guest rooms along with their world-famous casino floor that has various other entertainment options and resort amenities such as restaurants, pools, theater, and exercise facilities. The conference's technical program and social events will be held at the Waterfront Conference Center located at the Harrah's Resort Atlantic City.

For the latest information on the conference, including the technical program, local arrangements, housing and travel information, abstract submission and registration information, please visit the ICOPS 2017 website at <http://www.shu.edu/ICOPS2017>.

For further information contact the ICOPS 2017 Organizing Committee at ICOPS2017@ieee.org or directly contact the General Chair, Professor Jose L. Lopez by phone at +1 973-761-9057, or by E-mail: jose.lopez1@shu.edu.

21ST IEEE PULSED POWER CONFERENCE—PPC 2017

18th–22nd June 2017
Hilton Metropole Hotel
Brighton, United Kingdom

For its 21st conference, Pulsed Power is being held for the first time in the United Kingdom. The Pulsed Power Conference is a forum for the discussion of all aspects of the science, technology and application of Pulsed Power. Pulsed Power, the techniques for using electrical energy to generate high-power short pulse(s), is used in a large range of applications from plasma physics and particle-beam generation through intense magnetic-field generation to industrial and medical applications. PPC 2017 welcomes papers and presentations on all these topics and any others that apply to the Pulsed Power field.



Mark Sinclair
PPC General Chair



Bucur Novac
PPC Technical Program Chair



Neal Graneau
Conference Treasurer

The conference is being held at the Hilton Metropole Hotel, on the seafront of the town of Brighton situated on the south coast of England. Brighton is a popular and cosmopolitan town that has hosted many national and international conferences. One of the largest towns in England, Brighton has a long history reaching back to Roman times. Its more recent history is as a seaside resort, the Lanes, the Royal Pavilion, Brighton Pier and the i360 are all attractions of particular note.

The conference will be opening for registrations and abstracts on 7th November 2016; early commitment to the conference is encouraged, especially for those needing visas to visit the UK. The deadline for abstracts will be the 17th of February. Early registration for the conference, at a reduced rate, will close on 5th May; further registrations will have to be made at the conference. The conference will open on the 18th of June with a buffet reception.

At the conference we will be presenting the Pulsed Power Science and Technology, committee awards, the Marx award for outstanding technical contributions to the field of Pulsed Power, the Haas award for sustained management and influence of programs to support Pulsed Power and the Arthur H. Guenther Pulsed Power Student Award for the outstanding students of 2016 and 2017. The nomination deadline for all these awards is 1st December 2016. Please see the NPSS website (<http://ieee-npss.org/technical-committees/pulsed-power-science-and-technology/>) for details and application forms.

The organizing committee invites you to join us in Brighton for this, the 21st Pulsed Power Conference.

For additional information visit the conference web site <http://ieee-npss.org/technical-committees/pulsed-power-science-and-technology/> or contact the Conference Chairman, Mark Sinclair by E-mail at mark.sinclair@awe.co.uk

General Chair PPC 2017
Mark Sinclair

PPC 2017 Technical Program Chair
Bucur Novac,
Loughborough University

PPC 2017 Treasurer
Neal Graneau, AWE

2017 IEEE NSREC IS PLANNING FOR NEW ORLEANS

July 17th–21st, 2017

The IEEE Nuclear and Space Radiation Effects Conference will be held July 17th–21st, 2017 in New Orleans, at the New Orleans Marriott. The conference will feature a Technical Program consisting of nine sessions of contributed papers (both oral and poster) that describe the latest observations and research results in radiation effects, an up-to-date Short Course offered on July 17th, a Radiation Effects Data Workshop, and an Industrial Exhibit.



New Orleans

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 is 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.

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. Join us in 2017.

Technical Program

Chaired by Heather Quinn, LANL, papers to be presented at this meeting will describe the effects of space, terrestrial, or nuclear radiation on electronic or photonic devices, circuits, sensors, materials and systems, as well as semiconductor processing technology and techniques for producing radiation-tolerant devices and integrated circuits. The conference will be attended by engineers, scientists, and managers who are concerned with radiation effects.

The conference committee is soliciting papers describing significant new findings in the following or related areas:

Basic Mechanisms of Radiation Effects in Electronic Materials and Devices

- » Single Event Charge Collection Phenomena and Mechanisms
- » Radiation Transport, Energy Deposition and Dosimetry
- » Ionizing Radiation Effects
- » Materials and Device Effects

- » Displacement Damage
- » Processing-Induced Radiation Effects

Radiation Effects on Electronic and Photonic Devices and Circuits



Teresa Farris
RE Vice Chair-person of Publicity

- » Single Event Effects
- » MOS, Bipolar and Advanced Technologies
- » Isolation Technologies, such as SOI and SOS
- » Optoelectronic and Optical Devices and Systems
- » Methods for Hardened Design and Manufacturing
- » Modeling of Devices, Circuits and Systems
- » Cryogenic or High Temperature Effects
- » Novel Device Structures, such as MEMS and Nanotechnologies
- » Techniques for Hardening Circuits and Systems

Space, Atmospheric, and Terrestrial Radiation Effects

- » Characterization and Modeling of Radiation Environments
- » Space Weather Events and Effects
- » Spacecraft Charging
- » Predicting and Verifying Soft Error Rates (SER)

Hardness Assurance Technology and Testing

- » New Testing Techniques, Guidelines and Hardness Assurance Methodology
- » Unique Radiation Exposure Facilities or Novel Instrumentation Methods
- » Dosimetry

NEW DEVELOPMENTS OF INTEREST TO THE RADIATION EFFECTS COMMUNITY

Radiation Effects Data Workshop

The Radiation Effects Data Workshop is a forum for papers on radiation effects data on electronic devices and systems. Workshop papers are intended to provide radiation response data to scientists and engineers who use electronic devices in a radiation environment, and for designers of radiation-hardened or radiation-tolerant systems. Papers describing new simulation facilities are also welcomed.

Paper Submittal

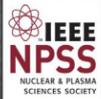
Information on the submission of summaries to the 2017 NSREC for either the Technical Sessions or the Data Workshop can be found at www.nsrec.com. The deadline for submitting summaries is February 3, 2017.

Technical Committees

COMPUTER APPLICATIONS IN NUCLEAR AND PLASMA SCIENCES



20th IEEE Real Time Conference
5-10 June 2016 - Padova



1 RT-2016 Conference Attendees



Chair Adriano Luchetta Opens the 2016 RT Conference



Roger Lecomte, University of Sherbrooke, Canada, this year's CANPS Award Winner

The 20th Real-Time Conference was held in Padova, Italy in June. It takes place every other year, with previous conferences held in Nara, Japan (2014), Berkeley, CA (2012), and Lisbon, Portugal (2010).

The Padova conference had the largest-ever turnout in both registered participants (234) and submitted abstracts (239). The abstract selection was managed by program chairs Réjean Fontaine from the University of Sherbrooke in Canada, and Martin Grossman from the Paul-Scherrer Institute in Switzerland. In the end, the conference had 52 oral presentations, 183 posters, and one additional presentation from the CANPS award recipient.

In addition to a superb scientific program, we were treated to a lot of local Italian flair. The conference chair, Adriano Luchetta from the local Consortio RFX and his crew, even organized a choir performance by the Caterina Ensemble, where a number of the local organizers are members (the artistic A very successful 20th Real-Time Conference in Padova, Italy program got added to the conference schedule, a very nice touch). We also had a wonderful excursion by bus and boat to the Veneto islands Murano and Burano, where we could observe the traditional glass blowers at work on Murano, and admire the colorfully painted houses as well as the beautiful local embroidery and lace-making on Burano.

After the traditional short courses on the Sunday before the conference (given by Stefan Ritt and Mariano Ruiz), the conference opened on Monday. The scientific program of the Real-Time Conference traditionally consists of plenary talks and poster sessions. In this way, one can concentrate fully on the oral presentations without the need to select between parallel sessions. Another long-standing feature of the Real-Time Conferences are "Mini-Orals" for poster presenters, who can present a short advertisement for their poster and aid the audience in selecting which posters to visit. On the opening day, after the welcome addresses, we heard invited

talks about the ITER diagnostics development by Michael Walsh and a presentation by Alberto Gennai about the Virgo test mass control, which is critical for catching gravitational waves. This was followed by one of the signature presentations by Pierpaolo Campostriini about the efforts to protect Venice against the rising sea levels, while at the same time preserving the lagoon biotope and maintaining an adequate amount of water exchange in the lagoon. Campostriini is one of the architects of the "shutoff valve" design that will soon protect the lagoon from the ever-more-frequent super tides that would otherwise flood the streets and palaces. The other signature talk was given by Roger Lecomte from the University de Sherbrooke in Canada, this year's CANPS award winner. His award citation reads "For contributions of real time techniques in the field of Positron Emission Tomography." In his presentation, Roger took us through a stunning review of the history of the readout technologies in medical-imaging applications, a field to which he himself has made many significant contributions. Congratulations to the CANPS award winner for a well-deserved recognition of his work.

The student award committee led by Christian Bohm (Univ. of Stockholm) selected five student papers to receive the prestigious student awards. The winners are: Dominic Gaisbauer from the Technische Universitaet Muenchen, Germany, Stephanie Su from the University of Michigan, Sergio Esquembri Martínez from the Universidad Politecnica de Madrid, Spain, Davide Pedretti, Università e INFN, Legnaro, Italy, and Chong Liu, University of Science and Technology of China. An honorable mention went to Marc-André Trétaut, who was ineligible for a prize since he had already won this award at the last conference. Following a tradition from the last conference, you can look forward to articles from the



Caterina Ensemble Sing in the San Gaetano .Church for RT attendees and guests—Sublime!



The colorful houses on the Veneto Island of Burano, which was part of the excursion.



The student award winners. From left to right: Dominic Gaisbauer, Stephanie Su, Davide Pedretti , Christian Bohm (student awards chair), Sergio Esquembri Martínez, Martin Purschke (CANPS chair), Marc-André Trétaut, and Chong Liu.

award winners about their work in future issues of this newsletter, one article at a time. Congratulations to the winners!

It is now time to start preparing for the next Real-Time conference in 2018, which will come back to the U.S. and will be held 10th–15th June 2018, in Williamsburg, Virginia. It will be hosted by Jefferson Laboratory and chaired by David Abbott.

For this year, a big thanks to the conference chair Adriano Luchetta, and all the organizers, members of the various committees, abstract reviewers, program and session chairs, and all presenters and participants, which made the 20th Real-Time Conference 2016 special and one of the best of its kind.

CUTTING REMARKS

The man who first abused his fellows with swear words instead of bashing their brains out with a club should be counted among those who laid the foundations of civilization.

John Cohen

US TOO!

What politics has become requires a level of tolerance for triviality and artifice and nonsense that I find I have in short supply.

Al Gore



Martin Purschke
Chair, CANPS Technical Committee

Martin Purschke, Chair of the CANPS Technical Committee, can be reached by E-mail at Purschke@bnl.gov.

FUSION TECHNOLOGY



Charles Neumeyer
Chair, Fusion TC

Following the transition of FTC Chair from J. P. Allain to C. Neumeyer, various housekeeping issues have been settled. The committee roster has been established (<http://ieee-npss.org/technical-committees/fusion-technology/>). Candidates have been nominated for the upcoming election of an FTC representative on the AdCom. Nominations have been received for the 2016 Fusion Technology Award and the selection process is underway, with the winner to be announced toward the end of July. And J.P. Allain has volunteered to serve as a Distinguished Lecturer representing the FTC.

Preparations continue for the 27th SOFE, June 4th–7th, 2017, chaired by Hutch Neilson. The venue will be the Marriott Shanghai City Center, Shanghai, China. This will be the first SOFE convened outside the U.S. and excitement is building. The SOFE will benefit from the key roles being played by the Institute of Plasma Physics, Chinese Academy of

Sciences (ASIPP), Hefei, an enthusiastic partner in organizing and running the conference. Plans are underway to identify a banquet location within walking distance of the conference hotel, and to establish a companion program that will include one cultural event and two sightseeing trips. Student participation is receiving special emphasis. An extensive minicourse program is being planned along with a well-financed student grant program. You are encouraged to visit the web site (<https://sofe2017.princeton.edu/>) and begin to make plans. Registration and abstract submission opens 14th November 2016.

Charles Neumeyer, Chairman of the Fusion Technology Technical Committee, can be reached by E-mail at Neumeyer@pppl.gov.

PULSED POWER SCIENCE AND TECHNOLOGY

Operating fully under our new by-laws for the first year has been exciting and brought with it a number of positive changes. Foremost, the transition to an elected technical PPS&T committee is in full swing. At the time of this writing, the nominations have closed and balloting shall commence in a few weeks. Not too long after the distribution of this newsletter, the first four elected members of the PPST committee will be announced in September of 2016. Thank you to the very qualified members of the community who have shown their desire to serve on the committee and whose names appeared on the

ballot. And thank you to everybody who has cast their vote in this inaugural committee election.

As we move forward, we would like to remind everybody in our community to assist each other in attaining professional recognition. This starts with nominating your collaborator or other professional contact for IEEE senior member. The paperwork required for such a nomination is limited and the main requirement is that candidates shall have been in professional practice for at least ten years. Once this has been established, the next step would be a nomination to IEEE fellow. This process is a bit more involved and much information may be found online at www.ieee.org under Membership & Services. Of course, I would like to encourage every distinguished member of our community considering elevation to the grade of IEEE Fellow, to discuss the matter with Gerry Cooperstein (gerald.cooperstein.ctr@nrl.navy.mil), who currently serves as chair of the PPST Fellow Nominations Committee. More information on the respective processes and contact information for our committee and its subcommittees may be found at ieee-npss.org under PPST.

Also, in accordance with our new PPS&T bylaws, the student award is now awarded annually. We are happy to announce that the 2016 Arthur Guenther Outstanding Student award was won by two graduate students: Mr. Dimity Mikitshuk of Weizmann Institute of Science, Rehovot, Israel, who is seeking his Ph.D. from the Faculty of Physics at the Weizmann Institute has been recognized



Andreas Neuber
Chair, Pulsed Power Science and Technology Committee

for his achievements in the development and implementation of noninvasive localized magnetic-field diagnostics for pulsed-power systems; Mr. Shelby Lacouture, Lubbock, Texas, who is seeking his Ph.D. in Electrical Engineering at Texas Tech University has been recognized for his achievements in the design and construction of multiple pulsed-power systems and the design and prototyping of a 3-D static magnetic field imager. The award will be officially presented next year along with the 2017 awards at our upcoming biennial conference. Hence, I would like to conclude with a reminder that the next Pulsed Power Conference will be held for the first time in the United Kingdom, in Brighton, from 18th–22nd June 2017. Brighton is an exciting place with the PPC conference hotel located right at the seafront featuring outdoor cafes and restaurants.

Andreas Neuber, chairman of the Pulsed-Power Science and Technology Technical Committee, can be reached by E-mail at andreas.neuber@ttu.edu.

Functional Committees

AWARDS

Announcement of the NPSS Glenn F. Knoll Educational Grants

NPSS announces the formation of two new educational grants in honor of one of our most admired and respected members, Glenn F. Knoll, who passed away in April of 2014. Prof. Knoll was a gifted teacher and mentor of many generations of students in the field of nuclear engineering.

Many of his students have had successful careers and are now leaders in our field. He was a Professor of Electrical Engineering at the University of Michigan and served as the Chair of that Department from 1979-1990, and then as Interim Dean of the School of Engineering from 1995-1996. He was a long-standing member of NPSS and served as the Chair of the Radiation Instrumentation Steering Committee as well as several terms on AdCom as a representative from the Radiation Instrumentation Technical Committee. He served briefly as Chair of the Publications Committee as well. For many years

he taught a very popular Short Course on Radiation Detectors at the Nuclear Science Symposium, and authored the widely used textbook, **Radiation Detection and Measurement**, now in its fourth edition

The IEEE Glenn F. Knoll Radiation Instrumentation Outstanding Achievement Award, so named in 2014, is presented each year by the Radiation Instrumentation Technical Committee. However, initiated this year, there are now two new grants in Prof. Knoll's honor, which are the IEEE Glenn F. Knoll Graduate Educational Grant and the IEEE Glenn F. Knoll Postdoctoral Educational Grant. These grants are intended to help further the studies and careers of graduate students and postdocs in the fields of nuclear science, medical imaging sciences and homeland security technologies. They were established by generous donations from Mrs. Gladys Knoll, Dr. Valentin Jordanov (a former student of Prof. Knoll) and funds from NPSS, and will provide a monetary award of \$5000 that can be used to support travel to and attendance at conferences, workshops or summer schools, or to support special research projects. They will be open to graduate students and postdocs who are members of both IEEE and NPSS and will be offered for the first time in 2017. Nominations will be accepted starting in the fall of this year and more information about how to apply for these prestigious new grants will be available soon on the NPSS Awards website.



Glenn F. Knoll

innovative technical and/or leadership contributions to the radiation effects community. The \$3000 cash award and plaque will be presented at NSREC New Orleans. Nomination forms are available electronically at <http://ieee-npss.org/technical-committees/radiation-effects/> and must be submitted by January 27th, 2017. Additional information can be obtained from Simone Gerardin, Member-at-Large for the Radiation Effects Steering Group. Simone can be reached at +39 049 827 7786, simone.gerardin@dei.unipd.it.

Paul Phelps Continuing Education Grant Nominations

Nominations are currently being accepted for the 2017 Paul Phelps Continuing Education Grant. The purpose of the grant is to promote continuing education (attendance at the 2017 NSREC Short Course) and encourage membership in NPSS. Outstanding members of NPSS who are either Student Members, Post-Doctoral Fellows or Research Associates, or unemployed members needing assistance in changing career direction can be nominated for the award. The actual amount of the grant will be determined prior to the 2017 NSREC in New Orleans. Funds are to be used towards covering travel costs to attend the NSREC Short Course. The winners will also receive complimentary short course registration.

Nomination forms are available electronically at <http://ieee-npss.org/technical-committees/radiation-effects/> and must be submitted by January 27th, 2017. Additional information can be obtained from Tom Turlfing, Junior-Member-at-Large, Aerospace Corporation, for the Radiation Effects Steering Group. Tom can be reached at 571-307-3715, thomas.l.turlfing@aero.org.

Conferences

Continued from PAGE 7

Short Course

Attendees will have the opportunity to participate in a one-day Short Course on Monday, July 17. The short course is being organized by Jonathan Pellish, NASA Goddard Space Flight Center. The course will be of interest both to radiation effects specialists and newcomers to the field alike.

Industrial Exhibit

An Industrial Exhibit will be included as an integral part of the conference and will be chaired by Annie Minez, 3-D Plus. Exhibitors will include companies or agencies involved in manufacturing electronic devices or systems for applications in space or nuclear environments, modeling and analysis of radiation effects at the device and system level, and radiation testing.

Committee

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NUCLEAR AND SPACE RADIATION EFFECTS

Call for Nominations for 2017 Awards

Nominations are due January 27th, 2017 for awards that will be presented at the IEEE NSREC 2017 Conference July 17th–21st, 2017 in New Orleans.

Radiation Effects Award Nominations

Nominations are currently being accepted for the 2017 IEEE Nuclear and Plasma Sciences Society (NPSS) Radiation Effects Award. The purpose of the award is to recognize individuals who have had a sustained history of outstanding and

Functional Committees Continued from PAGE 9

2016 NSREC Phelps Grant Recipients

The 2016 Paul Phelps Continuing Education Grant was awarded to four student members from the radiation effects community. At the opening of the NSREC technical sessions (July 11th, 2016), Allan Johnston, Chairman of the Radiation Effects Steering Group, announced the grant awards. The grants included tuition for the 2016 NSREC Short Course and a check for \$750.

The purpose of the Phelps Grant is to promote continuing education and encourage membership in the Nuclear and Plasma Sciences Society (NPSS). The criteria for judging are exceptional promise as a student, postdoc, or research associate in any of the fields of NPSS, or exceptional work in those fields by currently unemployed NPSS members with an expectation that attendance to at one or more of the Short Courses will result in an improved possibility of obtaining a job in an NPSS field.

The four recipients of the 2016 Paul Phelps Continuing Education Grant were Jean-Marc Belloir, Zachary Fleetwood, Serena Rizzolo, and Isaak Samsel.

Jean-Marc Belloir



Jean-Marc Belloir
2016 Phelps Grant Recipient

Jean-Marc Belloir was born in Rennes, France in 1990. He received the Materials Engineering degree from the Institut National des Sciences Appliquées (INSA, Rennes, France) and held a six-month internship at ESA (ESTEC, Noordwijk, Netherlands) to study radiation-induced CTI in CCDs. He is currently pursuing a Ph.D. degree at Institut Supérieur de l'Aéronautique et de l'Espace (ISAE, Toulouse, France) in collaboration with Centre National d'Etudes Spatiales (CNES, Toulouse, France) and Commissariat à l'Energie Atomique (CEA, Bruyères-Le-Châtel, France). His work aims at studying the defects responsible for the dark-current increase due to displacement damage in CMOS image sensors. To do that, he uses the dark-current spectroscopy technique to detect and identify the defects in CMOS image sensors irradiated with various particles. Jean-Marc has presented his work at both NSREC and RADECS technical sessions in 2015, and received the RADECS 2015 Best Student Paper Award. Jean-Marc has authored or co-authored five papers and expects to receive his Ph.D. degree at the end of 2016. He was nominated by Dr. Philippe Paillet from CEA.

Zachary Fleetwood



Zachary Fleetwood
2016 Phelps Grant Recipient

Zachary Fleetwood is pursuing his Ph.D. in the School of Electrical and Computer Engineering at the Georgia Institute of Technology in Atlanta, Georgia. His studies involve investigating radiation effects (total ionizing dose and single-event effects) in silicon and silicon-germanium (SiGe) based

microelectronic technologies. The focus of his Ph.D. dissertation work is on correlating fundamental damage mechanisms between heavy-ion-induced single event transients (SETs) and laser-induced SETs in SiGe heterojunction bipolar transistors (HBTs). His research leverages advanced models and simulations in order to identify the underlying physical phenomena involved with single event effects. The aim of his work is to help accelerate testing schedules for costly broad-beam experiments. He has authored or co-authored 16 publications. He received the NSREC 2014 Outstanding Student Paper Award and the BCTM 2015 Best Student Paper Award. He is advised by Dr. John D. Cressler, Schlumberger Chair Professor in Electronics. His research is supported by collaborations with the Defense Threat Reduction Agency (DTRA) and the Naval Research Laboratory (NRL).

Serena Rizzolo



Serena Rizzolo
2016 Phelps Grant Recipient

Serena Rizzolo completed her Ph.D. (April 4th, 2016) while working in the area of radiation effects on optical fiber technology and associated systems, in collaboration with the University of Saint-Etienne (France) and the University of Palermo (Italy). Her Ph.D. project deals with the development of radiation-hardened distributed optical-fiber sensors for the monitoring of temperature and water level inside storage fuel pools (SFP). Specifically, she has studied the permanent and transient radiation effects on the performances of Optical-Frequency-Domain Reflectometry-based optical fiber sensors. The acquired knowledge allowed her to develop a prototype of a temperature and liquid-level sensor that was tested in realistic conditions. The results of her Ph.D. studies have shown that this architecture of sensors can be integrated in the SFPs (two pending patents, 2015). Serena has authored or co-authored seven publications in international journals and she has attended NSREC, RADECS and ANIMMA conferences during her final Ph.D. year. She will continue to work in the radiation field with a post-doc position on image sensors characterization. Her Ph.D. supervisor, Pr. Sylvain Girard, nominated her.

Isaak Knox Samsel



Isaak Knox Samsel
2016 Phelps Grant Recipient

Isaak Knox Samsel is a Ph.D. student in electrical engineering at Vanderbilt University in Nashville, Tennessee. He received his B.S. in electrical engineering at University of Tennessee, Knoxville. As a member of Vanderbilt's radiation effects and reliability research group, Isaak's research focus is on single-event effects (SEEs) in nonsilicon electronics. His research has included investigating the charge collection behavior and mechanisms of AlGaN/GaN MOS-HEMTs, SiGe-channel and Ge-channel planar MOSFETs, and Ge-channel FinFETs, utilizing heavy-ion irradiation as well as two-photon and single-photon laser irradiation. His dissertation work involves utilizing electro-optical measurement

techniques to probe radiation-induced, transient signals with resolution not possible with conventional oscilloscope measurements. In summer 2014, Isaak was a visiting scholar at imec in Leuven, Belgium. In January of 2016, Isaak began the Pathways Internship program, working with the NASA Goddard Space Flight Center's Radiation Effects and Analysis Group. Isaak has authored or co-authored seven journal or conference publications, and was the recipient of the GOMACTech 2015 Best Student Poster award. His advisor at Vanderbilt is Professor Robert A. Reed. His work is supported in part by the Defense Threat Reduction Agency (DTRA).

CALL FOR NOMINATIONS

Pulsed Power Science and Technology Awards,



Bryan Oliver
PPST Awards Chairman

Dec 1st 2016 deadline

The NPSS Pulsed Power Science and Technology Committee is soliciting nominations for:

Erwin Marx Award:

To recognize outstanding technical achievements in pulsed power engineering, science and technology by an individual over an extended period of time. Individuals who have made outstanding technical contributions to pulsed power technology for at least ten years are eligible.

Peter Haas Pulsed Power Award:

To honor individuals whose efforts, over an extended period of time resulted in important pulsed power programs and the growth of important areas of activity including research, education, applications and information exchange. Any individual who has demonstrated sustained contributions to developing, managing or influencing programs, education or information exchange that has led to important advances in the field of pulsed power is eligible.

2017 Arthur H. Guenther Outstanding Pulsed Power Student Award:

To recognize outstanding contributions as a student in pulsed power engineering, science or technology. Candidates for this Award will be solicited annually and the selection process will be completed each year. Any full-time undergraduate or graduate university student in pulsed power engineering or science is eligible. The nominee must be a student when nominated.

Further details on the awards and nomination process can be found on the webpages of the NPSS Pulsed Power Science and Technology Committee: <http://iee-nps.org/awards/technical-committee-awards/>. Further information may also be obtained by contacting the NPSS PPST Awards Committee Chair, Bryan V Oliver (bvolve@sandia.gov). Please note that these awards now have a Dec 1st, 2016 nomination deadline.

PARTICLE ACCELERATOR SCIENCE AND TECHNOLOGY AWARDS

IEEE is the world's largest professional association dedicated to technology innovation. The IEEE Nuclear and Plasma Sciences Society grants the Particle Accelerator Science and Technology Award to individuals who have made outstanding

contributions to the development of particle accelerator science and technology.

Two Awards are granted at each of the Particle Accelerator Conferences held in North America (PAC or IPAC). The 2016 PAST Awards and the PAST Doctoral Student Award will be presented at the 2016 North America Particle Accelerator Conference (NA-PAC'16), which will be held in Chicago, Illinois, October 9th–14th, 2016.

Dr. Anna Grassellino



Anna Grassellino
2016 PAST Award Recipient

Dr. Anna Grassellino of Fermi National Accelerator Laboratory is a winner of the IEEE NPSS Particle Accelerator Science and Technology Award for 2016.

Anna Grassellino receives the IEEE PAST Award for her pioneering work on nitrogen doping of SRF cavities. This work includes the discovery of the effect itself; making it into a simple, practical technology; transferring the know-how to other laboratories and industry; and finally successfully implementing it in an accelerator. This advance is regarded as one of the largest breakthroughs in the field of radio-frequency superconductivity in the past 10-plus years. CW accelerators around the globe will benefit from these findings; as an example LCLS-II at SLAC National Accelerator Laboratory will be the first beneficiary of nitrogen doping. The new surface processing technique can result in an overall potential cryogenic cost reduction by a factor of more than two compared to previous state-of-the-art treatments.

Anna Grassellino is a scientist and group leader at Fermilab. She is the recipient of various prizes among which are the prestigious \$2.5M DOE Early Career Award for her work on High Q cavities. Her group's work spans from fundamental understanding of SRF cavity performance, to R&D for cavity performance improvement for Q and gradient frontiers, to leading the cavity measurements for research and projects at the FNAL SRF vertical test facility. Anna also serves as Cavity Measurement lead scientist in the FNAL SRF program, and as FNAL LCLS-II lead for acceptance and qualification of LCLS-II production cavities. Under her leadership the FNAL cavity research program has seen some major breakthroughs in performance improvement and understanding, for both the gradient and Q frontier. Anna also serves on various committees, among which is the APS-DPB executive committee for which she was recently elected member-at-large.

Citation: for pioneering nitrogen-doping of superconducting RF cavities.

Dr. Wim Leemans

Dr. Wim Leemans of Lawrence Berkeley National Laboratory is a winner of the IEEE NPSS Particle Accelerator Science and Technology Award for 2016.

Dr. Wim Leemans is currently the Director of the Accelerator Technology and Applied Physics (ATAP) Division and its BELLA Center (Berkeley Lab Laser Accelerator) at Lawrence Berkeley National Laboratory. He obtained an electrical engineering degree from the Vrije Universiteit Brussel, Belgium, in 1985, and a Ph.D. from UCLA in 1991. He joined LBNL in 1991 and, in 1994, started the LOASIS Program (now BELLA Center) in what is now the ATAP Division. For more than three decades, Dr. Leemans' main research areas have been plasma-based accelerator science, advanced radiation sources, and development of laser technology for future accelerators. His Ph.D. dissertation was on

physics related to beat-wave acceleration and in the mid-1990s he launched experiments at LBNL to investigate methods for guiding high intensity laser pulses in preformed plasmas. In 2004, jointly with two other international teams, he and his team were the first to show the possibility for laser plasma accelerators to produce quasi-monoenergetic electron beams. The Berkeley team was the first to use laser preformed plasma channels to produce such beams. In 2006, he led the team that demonstrated the generation of a 1 GeV beam with a capillary-discharge-based plasma channel to guide 40 TW peak power laser pulses over extended distances. With his team, the first demonstration of techniques for controlled injection relying on longitudinal tailoring of plasma density profiles to control the phase velocity of plasma waves was experimentally achieved as well as measurements of ultra-low emittance and evidence for low slice energy spread based on coherent optical transition radiation. In 2014, after leading the construction of the BELLA laser system, the world's highest repetition rate PW-class laser, he led the team that demonstrated 4.25 GeV electron beams from 9-cm-long, capillary-discharge-based structures. In 2016, he and his colleagues were the first to show staging of two consecutive, independently laser-powered plasma structures, an essential step towards a future collider. With his theory colleagues he has proposed many methods for controlling, observing or enhancing the performance of laser-plasma accelerators including the colliding pulse technique, betatron emission, laser guiding and group velocity control. Over the past five years, he has been instrumental in launching a joint effort between laser and accelerator physicists to increase the average power of lasers that drive plasma-based accelerators,



Wim Leemans
2016 PAST Award Recipient

an essential requirement for future applications. He has received numerous awards including the 1992 APS Simon Ramo award for outstanding doctoral thesis research work in plasma physics, the 1996 Klaus Halbach Award for X-ray Instrumentation, the 2005 United States Particle Accelerator School Prize for Achievement in Accelerator Physics and Technology, the 2009 E.O. Lawrence Award from the U.S. Department of Energy, the 2010 American Physical Society John Dawson Award for Excellence in Plasma Physics Research, the 2012 Advanced Accelerator Concepts Prize and the 2014 Department of Energy Secretary's Achievement Award for the BELLA Project. He is also a Fellow of the American Physical Society, Institute of Electrical and Electronics Engineers, and American Association for Advancement of Science. Dr. Leemans has been research advisor for more than twenty Ph.D. graduate students, two who received the APS outstanding dissertation award (2005 & 2006) and one who received the Japanese PJAS prize for an outstanding dissertation (2007).

Citation: for pioneering development of laser-plasma accelerators.

2016 PARTICLE ACCELERATOR SCIENCE AND TECHNOLOGY DOCTORAL STUDENT AWARD

Dr. Sam Posen

Dr. Sam Posen of Fermilab National Accelerator Laboratory is the recipient of the 2016 IEEE Particle Accelerator Science and Technology Doctoral Student Award.

The IEEE Nuclear and Plasma Sciences Society presents the Particle Accelerator Science and Technology Doctoral Student Award to individuals who have done outstanding thesis research in particle accelerator science and technology. This award is made to recognize significant and innovative technical contributions to the field of particle accelerator science and technology as demonstrated in a student's doctoral thesis.

Sam Posen earned his undergraduate degree from Queen's University in 2009, at the top of his class in Engineering Physics. He then began the pursuit of a Ph.D. in Physics at Cornell University, where he conducted research under Matthias Liepe on superconducting RF (SRF) cavities. Selecting Nb₃Sn coatings for SRF cavities as his Ph.D. research topic, Sam endeavored to develop a technology that had the potential to substantially improve the performance of SRF cavities but had been plagued with limitation from Q-slope in previous experiments. Sam designed and assembled a coating chamber for fabricating Nb₃Sn in Cornell's high-temperature vacuum furnace. After coating samples that showed near-ideal stoichiometry and critical temperature, he moved on to cavities, demonstrating for the first time an accelerator cavity using an alternative material that significantly outperforms niobium at a useful temperature and gradient. The cavities he coated showed reproducible high Q₀ at 4.2 K, minimal Q-slope, and quench fields above 10 MV/m. His accomplishments earned several poster prizes before he was granted his Ph.D. in 2015.

From Cornell, Sam moved to Fermilab, where he now is an Associate Scientist in the SRF department. He also is a member of Fermilab's Scientific Advisory Council and a member of the Executive Committee of the American Physical Society's Division of Physics of Beams. Sam continues his research on Nb₃Sn SRF cavities at Fermilab, where he plans to push state-of-the-art performances through novel coating procedures, and to scale up to coating full production-style cavities. Sam hopes that high quality Nb₃Sn cavities can one day increase the reach of powerful large-scale accelerators and enable new small-scale industrial applications, including in medicine, border security, and flue gas and wastewater treatment.

Citation: For contributions to the development of Nb₃Sn SRF cavities.

CHAPTERS

Alexandria Student Branch Chapter

From the time of the last report, the NPSS AlexSC's organized two sessions. One hosted an NPSS distinguished lecturer and the other hosted a nuclear-engineering graduate who has more than 15 years of experience in engineering fields not directly related to the nuclear-engineering specialization

NPSS AlexSC's current board was honored to finally host an NPSS Distinguished Lecturer during its presidential time. This stems from the realization that the Distinguished Lecturer Program (DLP) aims to provide stimulus and support for NPSS chapter meetings via high-quality technical and scientific lectures by distinguished experts from the NPSS technical communities.

We were honored to have the distinguished Professor Ahmed Hussein to give a talk on Dual Fluid Reactor (DFR). Prof. Hussein received his B.Sc. in applied physics from Alexandria University, M.Sc. and Ph.D. in nuclear physics from University of Alberta, Canada. He is the Co-inventor of the DFR (patent pending). Prof. Ahmed is also a senior member of IEEE, and Chair of the Joint Applied Physics Chapter, Vancouver Section.



Farah el Sayed
R&P Committee member

This seminar was organized to discuss the basic concept of the Dual Fluid Reactor which is a new Gen IV nuclear reactor concept that is still under development. Prof. Ahmed Hussein explained the basic idea of nuclear reactors (induced fission, the chain reaction and the role of control rods) and overviewed the problems encountered with current reactors that led to probing advanced concepts such as the DFR. He also introduced current statistics on operating reactors and reactors under construction. Then he talked about how energy sources are efficiently selected based on a variety of characteristics; for example: having a high energy density, providing the minimum demand base load and having minimal pollution effects.

Brief comparisons between nuclear sources and other sources of energy (renewable and non-renewable) based on the characteristics mentioned above were introduced. Finally, Prof. Hussein introduced the Molten Salt Experiment and then continued explaining the concept of the Dual Fluid Reactor. He explained the proposed two-loop concept and the different passive safety systems involved in the DFR concept. He then talked about the dual fluid concept on which the reactor is based. He ended the session by introducing estimated total costs of the DFR, the estimated time and the required investment to build the reactor followed by some of its applications including those related to gas turbines, petrochemical and hydrogen plants.

During this seminar, the audience gained knowledge about innovative ideas and solutions for challenging problems facing current generation of reactors concerning their designs, cost and safety systems.

The second session organized by the NPSS AlexSC was named Nuclear Engineers in Industry. The session's goal was to introduce job opportunities for the nuclear engineering students in different fields of industry not necessarily directly related to the nuclear-energy field. The session was oriented to show the students how the graduate nuclear engineer can fit in many work areas using related scientific background and engineering skills in light of the low market demand for nuclear engineers due to the delay in the nuclear program at least for the time being. The session targeted the undergrad students who are in their last year in college.

The speaker was Dr. Mohammed Hatem who has a Ph.D. in nuclear engineering and more than 15 years of work experience in different industrial areas. He spoke about how students could catch up with the

industry requirements just after the graduation. Dr. Mohammed also talked about how to be prepared and get the qualifications that are required to be a professional engineer. He also talked about the different industrial applications that might fit fresh graduate nuclear engineers.

The seminar helped the students to define the real opportunities in the industry and the qualifications required for such positions.

For further information, contact Haidy M. Abd El-Kader, Secretary, Alexandria Student Branch Chapter by E-mail at Haidy.M.AbdElKader@ieee.org.

PUBLICATIONS

Medical Content Moving to TRPMS

As described in previous Newsletters, the Nuclear and Plasma Sciences Society (NPSS) is launching a new journal, the *Transactions on Radiation and Plasma Medical Sciences* (TRPMS). It is cosponsored by the Engineering in Medicine and Biology Society (EMBS). The Editor-in-Chief for TRPMS has been selected (Dimitris Visvikis; dimitris@univ-brest.fr), and he is working on the first issue which will be published in January, 2017.

The scope of the IEEE TRPMS encompasses technology and application areas related to radiation- and plasma-based medical sciences. These areas include radiation detectors for medical and biological applications; imaging system design/optimization/performance; therapy-related system design/optimization/performance; radiation-application-based image reconstruction, data analysis and image processing; medical radiation therapy applications; clinical/preclinical evaluation of imaging and therapy systems, plasma applications in medicine and biology; and simulations for imaging and therapy applications. Educational material such as technical/clinical review papers covering the above subjects of interest is also included.



Paul Dressendorfer
NPSS Publications Committee Chair

The objective of this journal is to create a unique publication related to the application of radiation and plasma sciences within the medical field. TRPMS aims at combining the larger and well-established field of radiation medical applications with the upcoming plasma medical sciences domain, providing a unique venue for the publication of radiation- and plasma-based medical sciences. No such journal exists today either within IEEE or other publishers.

Both of the current NPSS publications, the IEEE *Transactions on Nuclear Science* (TNS) and the IEEE *Transactions on Plasma Science* (TPS), publish papers with medical sciences content. That content is transitioning to the new journal TRPMS.

Thus beginning immediately, both TNS and TPS will no longer be accepting medically related manuscripts. We strongly encourage authors to submit such work to TRPMS instead at <https://mc.manuscriptcentral.com/trpms>. We believe that authors will find the review process to be as beneficial as that of TNS and TPS, and that publication of their work in this journal will be to their advantage compared to TNS, TPS, or other possible publication venues.

Paul Dressendorfer, NPSS Pubs Chair, can be reached by E-mail at dressepv@swcp.com.



Alexandria Student Branch Chapter Members with Dr. Ahmed Hussein

Liaison Reports

EAB EDUCATION LIAISON



Edl Schamiloglu
EAB Liaison

IEEEEx Update

Several massive open online courses (MOOCs) were released on IEEEEx, IEEE's space on the edX platform. In April 2016 alone, three new courses were launched addressing data storage, systems biology, and technical standards. In addition, two popular existing courses were rerun in April. More than 12,000 learners were reached in April through those courses. In May 2016, a new course began on the topic of "Big Data for Smart Cities," which was developed in partnership with the IEEE Smart Cities Initiative and IEEE Future Directions. Learners from more than 125 countries were represented in the course. In addition, IEEEEx's most popular course to date, "Introduction to Cloud Computing," reran in May. More than 75,000 learners have registered for this course during its three runs.

Accreditation

Accreditation.org is a free online resource that offers information on Engineering, Technology and Computing (ETC) accreditation globally. The portal provides descriptions of accrediting organizations around the world, a searchable global database of accredited programs, and details on mutual recognition agreements. Those using the accredited program search can search by degree category, country, or university name and generate a list of all currently accredited programs as well as an indication of which organization provided accreditation.

IEEE Pre-University Education Helping Students Imagine the Careers of 2030

In 2016, IEEE Educational Activities received a seed grant from the IEEE New Initiatives Committee to develop three short videos featuring IEEE members engaging in cutting-edge work in IEEE's fields of interest. The videos are intended to provide pre-university students with an inspiring look into the careers of 2030. The videos will showcase how IEEE members are shaping our future and blazing the path for students who will become the engineers of tomorrow. Students will learn how a career in engineering will enable them to make a world of difference by working at the forefront of technological innovation.

Collaborative, inquiry-based lesson plans relating to the content of each video will also be developed. Educators can use these lesson plans in conjunction with the videos to further engage students through related hands-on experiences. The videos and lesson plans will be featured on TryEngineering.org and TryComputing.org, which reached over 2.5 million pre-university students, educators, and parents in 2015.

Edl Schamiloglu, IEEE NPSS Liaison to the Educational Activities Board, can be reached by E-mail at edls@unm.edu.

RATHER USEFUL, EH?

...science helps us distinguish between the way things seem and the way they are...

Rebecca Goldstein

COALITION FOR PLASMA SCIENCE

Biomedical work earns CPS Excellence in Plasma Physics Award at INTEL ISEF

Phoenix, AZ - It seems like only yesterday CPS was sending an inquiry to INTEL International Science and Engineering Fair (ISEF), asking to sponsor a \$1000 prize for a student presenting a plasma-related project at the fair. It was 2005. Eleven years later, with the prize increased to \$1500, CPS has happily observed the growing interest in plasma-oriented experiments at the INTEL ISEF. This year three judges, including CPS Chair Lee Berry, Princeton Plasma Physics Laboratory Senior Program Leader Arturo Dominguez and UCLA Postdoctoral Scientist Seth Dorfman, evaluated 15 student projects. In a ceremony on May 13th, 2016, they ultimately gave the 11th CPS Excellence in Plasma Physics Award to Nathan Kinsey for "Lightning in a Bottle: Effect of Plasma Activation on Muscle Cells." (Figure 1)

Kinsey hypothesized that applying plasma to muscle cells "would enhance cell growth and wound recovery, and that growth would be proportional to intensity of plasma application." Using a micro-plasma cutter "fabricated from 9V batteries, wire, graphite and aluminum foil," Kinsey applied plasma to muscle cells both directly (to cells in media) and indirectly (to media, which was then applied to cells). He also varied the intensity of the plasma dose.

He discovered that in this case less is more. Applying low doses of plasma directly or indirectly to the muscles resulted in longer cells with greater growth, while high doses sometimes killed the cells, or resulted in shorter cells. Wounds also healed more quickly and successfully when using an indirect, low-dose approach.

Lee Berry noted, "An interesting finding was there was a 'Goldilocks' level that, apparently, optimally balanced the positive effect of enhanced growth with the negatives of too much plasma." The judges were impressed with Kinsey's ingenuity in developing the plasma source and his careful attention to controls and statistical significance. "Equally impressive were his enthusiasm and ideas for future work on the project," said Berry.

An essay on "Plasma Medicine" is part of the CPS "About Plasmas" series, and is easily accessible via the publications section of the CPS web site. Although the majority of science-fair projects approach plasmas from the point of view of physics or astrophysics, more students are choosing to explore medical/biological applications of plasma. The last time CPS awarded a prize to a plasma-medicine project was in 2010, when Turkish student Bilge Zeren Aksu explored the possibility of killing cancer cells with oxygen plasmas.

Of the remaining fourteen plasma-related projects, eight received a total of 9 other awards at the event.

Plasmatic Events during Electrolysis of Aqueous Solutions: Benedickt Pintat, Walther-Rathenau-Gymnasium, Bitterfeld-Wolfen, Germany. Received *American Chemical Society Honorable Mention*

Investigating the Acoustic Flame Interaction with the Effects of Magnetic field and Plasma: Omar Abdulrahman Alhazzaa, Najd National School, Riyadh, Riyadh, Saudi Arabia. Received *Society of Experimental Test Pilots, United Technologies Corporation Honorable Mention—\$3000 in UTC stock*

Novel Synthesis of Water-Soluble Paramagnetic Polymer Nanoparticles (Metal Free) for Selective Drug Delivery and Cancer Therapy Applications: Amob Das, Jesuit High School, Portland, OR, USA



Figure 1: Nathan Kinsey (center) discusses his winning project with CPS judges Arturo Dominguez (left) and Seth Dorfman. Photo: Lee Berry



Figure 2: Shailaja Humane received a Physics and Astronomy Second Prize for her study of "Electrically- Induced Acoustic Oscillations of Gas Bubbles." Photo: Lee Berry

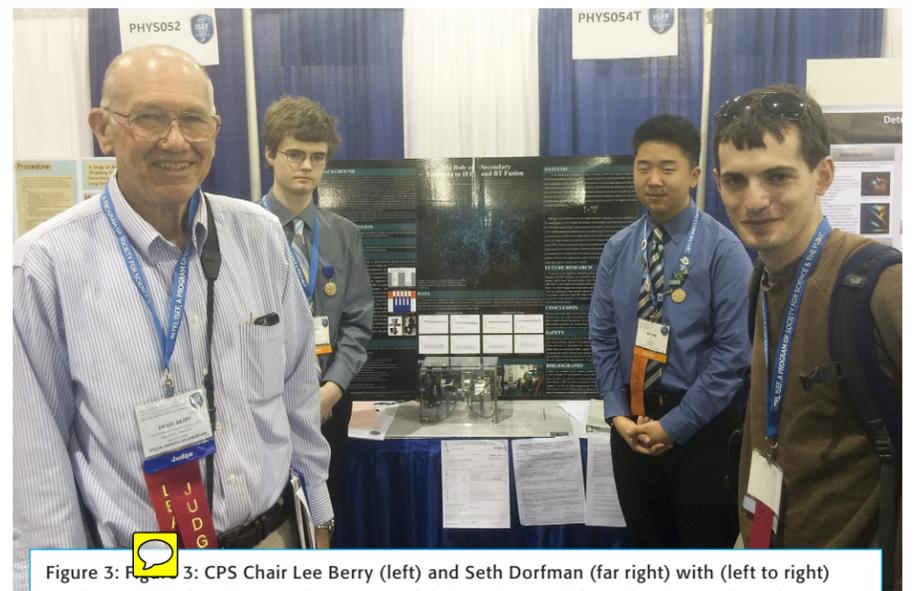


Figure 3: CPS Chair Lee Berry (left) and Seth Dorfman (far right) with Noah Hoppis and Kevin Lee, who presented their project on "The Role of Secondary Electrons in IEC and BT Fusion." Photo: Arturo Dominguez

Received *Materials Science Second Award (\$1500)* and *Arizona State University New American University Scholarship*

Spectroscopic Analysis of Titanium Oxide Presence in Stars: Sarah Amina Maazouz, Liberty High School, Hillsboro, OR, USA. Received *European Organization of Nuclear Research—CERN—all expense paid trip to CERN*

Electrically-Induced Acoustic Oscillations of Gas Bubbles: Shailaja Humane, Watchung Hills Regional High School, Warren, NJ, USA. Received *Physics and Astronomy Second Award (\$1500)* (Figure 2)

Analysis of Chemical Vapor Deposition Diamonds for Neutron Detection on OMEGA: Ishir Seth, Brighton High School, Rochester, NY USA. Received *Physics and Astronomy Fourth Award (\$500); Alternate for CERN trip*

Holistic Flare Prediction using Aggregated Solar Cycle 23-24 Magnetograms and Intensitygrams: Shengdong Wang, Hamilton High School, Chandler, AZ, USA. Received *Arizona State University New American University Scholarship*

Astrophysical Modeling of Wolf Rayet Stars Using Low Resolution Gratings: Ivo Jose Goncalves, Daniel Alexandre Diaz da Costa, Mauro Barbosa Franqueira, 18, Escola Secundária Dona Maria II, Braga, Portugal. Received *Physics and Astronomy Fourth Award (\$500)*

CPS judge Arturo Dominguez was impressed with the student work. "As with last year, these high-schoolers blew me away. They did some amazing work, many at advanced undergraduate level. I was particularly impressed by the number of projects that incorporated plasma physics in fields other than fusion and astrophysics, such as the winning entry. The fact that there were projects exploring plasma physics in biology, water purification, rocket propulsion, etc., highlights the versatility of the field.

It's inspiring to see these young minds getting interested in the field."

The Intel International Science and Engineering Fair, a program of Society for Science & the Public, is the world's largest precollege science competition, and includes more than 1,700 high school students from more than 75 countries, regions and territories. Each year, the finalists showcase their independent research as they compete for approximately

\$4 million in awards. The Intel International Science and Engineering Fair encourages millions of students worldwide to explore their passion for innovation and develop solutions for global challenges.

Students are able to compete as a finalist in the Intel International Science and Engineering Fair after winning a top prize from a Society-affiliated fair (419 of which are bringing finalists this year) in more than 75 countries, regions and territories. In addition to

presenting their research on an international stage, Intel International Science and Engineering Fair finalists are judged by and interact with doctoral-level scientists as they compete for prizes. Each year, more than 400 finalists receive awards and prizes for their groundbreaking research. We hope that the interactions with other finalists and the judges, as well as the recognition and awards, encourage the students to continue their involvement in science and technology. (Figure 3)

The CPS Intel ISEF award is supported in part by contributions from the American Physical Society, Division of Plasma Physics and the Institute of Electrical and Electronic Engineers, Nuclear and Plasma Science Society.

OOPS!

When everything is coming your way, you're in the wrong lane.

Steven Wright

Articles

Positron Emission Tomography: Current Status of Motion Correction



Se Young Chun

Positron Emission Tomography (PET) provides researchers and clinicians with metabolic and molecular information about the disease status of patients. PET has been used for diagnosing and monitoring diseases such as cancers, cardiac malfunctions, and neurologic disorders. A PET scanner counts positrons emitted from radiotracers by detecting pairs of gamma rays from positron annihilations. Then, image reconstruction algorithms (e.g. OSEM) convert measured photon pairs into the 3D distribution of radiotracers. Since the biomolecule is labeled with a positron-emitting radiotracer, this 3D distribution of radiotracer can be considered as the 3D distribution of the biomolecule. Therefore, underlying metabolic and molecular information inside a subject's body can be estimated. For example, by injecting [¹⁸F]-fluorodeoxyglucose (FDG) into a subject and measuring the [¹⁸F] distribution using PET, one may be able to obtain localized metabolic information about glucose and its unusually high consumption by cancer cells.

PET requires several minutes (or a few minutes for time-of-flight PET) to obtain reasonably low noise measurements. However, typical respiratory and cardiac motion cycles are 5 and 1 seconds, respectively. Thus, it is inevitable that acquired data is contaminated with motion artifacts due to respiratory and cardiac motions during the acquisition time. Reducing motion artifacts has been desirable in PET image reconstruction. Motion was a concern even at the early stage of PET development in the 1970s. In [1], Phelps *et al.* reported that minor artifacts were observed due to 1.5 cm of relatively large motion. However, at that time, the spatial resolution of this early stage PET scanner (ECAT) was 0.95 cm. The effective spatial resolution of ECAT due to motion is about 1.78 cm, which is close to the original spatial resolution of about 1 cm. Thus, motion did not introduce severe motion artifacts for relatively poor resolution PET images as observed. With the advancement of PET instrumentation and image reconstruction algorithms, modern PET systems can achieve about 2.5 mm spatial resolution. In this case, the effective spatial resolution due to 1.5 cm motion is about 1.52 cm, which is much poorer than the original spatial resolution of 0.25 cm. Therefore, subject motion becomes one of the key factors to deteriorate the image quality of modern PET imaging.

One remedy for motion artifacts in PET is gating [2]. Periodic cardiac and respiratory information can be obtained from indirect surrogate measures such as electrocardiogram (ECG) and respiratory

bellows, respectively. Then, PET measurements can be binned into several motion phases and the data in each bin can be used for image reconstruction. Gated data contains negligible motion artifacts and has proven to be effective for better quantitative PET imaging without explicit motion estimation [3]. However, the gating procedure distributes total counts into several temporal bins so that each reconstructed image from gated data usually contains high noise. Practically, gating requires 2-3 times longer data acquisition time for reasonable noise level (e.g. [3]). However, long acquisition time and the idea of discarding counts corresponding to other motion phases may not be desirable.

Motion-compensated image reconstruction (MCIR) methods account for non-rigid cardiac or respiratory motions during or after PET image reconstruction.

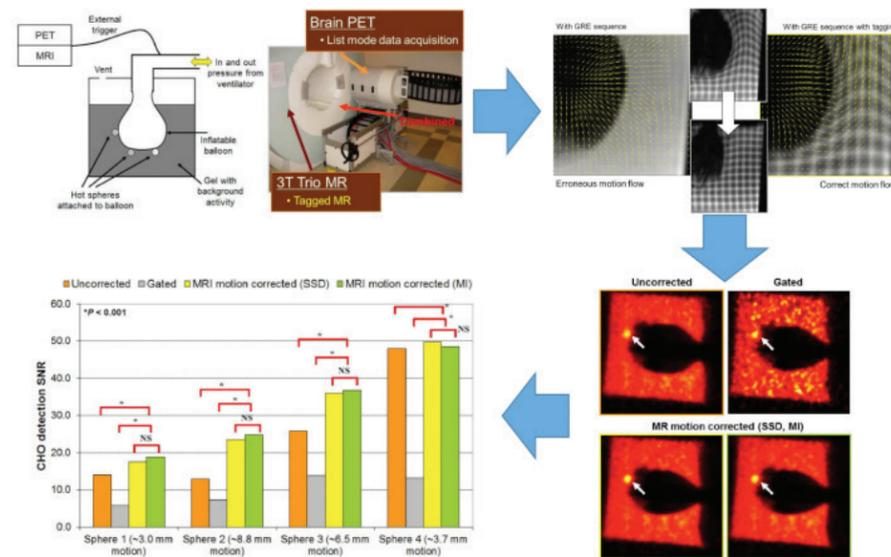
and regularizer terms introduce nonuniform and anisotropic spatial resolution [7]. Then, we proposed regularization design methods for different MCIRs to yield an approximate target local impulse response. We showed that it is possible to design quadratic regularizer weights so that all MCIR methods can have a uniform and isotropic spatial resolution [7]. We also derived analytical noise expressions for MCIR methods and performed analytical and empirical comparisons between different MCIRs with matched spatial resolution [8]. We showed that MCIR methods of parametric motion model [5] and of temporal regularizer [6] have superior noise properties over the MCIR method of summing aligned images [4].

The nonrigid motion estimation problem is *ill-posed*. In other words, there are too many possible solutions

The quality of motion information is critical for the success of MCIR methods. However, most MCIR methods use noisy PET images to estimate deformations [4, 5, 6, 10]. Good motion regularizers could help to improve the quality of motion estimation, but the poor quality of noisy image source was one of the bottlenecks for good quality motion information. Motion estimation from 4D CT images in hybrid PET-CT scanners has been investigated and conjectured in many MCIR studies. However, there are many concerns in this approach such as high radiation dose due to 4D CT and motion information mismatch between PET and CT due to sequential acquisition of PET and CT.

Recently developed simultaneous PET-MR opened up new possibilities for motion correction in PET. Well-aligned PET and MR images can be obtained simultaneously without increasing radiation dose due to CT. High quality motion information can be obtained from MR and can be applied to PET motion correction. We measured motion information from tagged MR images using B-spline-based image registration methods [9] and incorporated it into the MCIR framework [11]. We validated our proposed methods using deformable motion phantom studies with attached radioactive spheres (as shown left), rabbit studies with the surgical implantation of radioactive beads in the liver, and nonhuman primate studies. We showed that our proposed methods yielded comparable image quality to a gating method with much longer acquisition time (at least 5 times) [11]. We also performed channelized Hotelling observer (CHO) studies for motion phantom and rabbit studies and showed the improvement of detection signal-to-noise ratio (SNR) using our proposed motion correction methods [11]. However, there were still a couple of limitations in this work: gating signal from respiratory bellows may not be accurate and tagging signal did not last more than a second in 3T MRI while respiratory cycle is about 5 seconds. Recently, Dutta *et al.* proposed a MR navigator-based MCIR method for whole body PET-MR and evaluated their method using simulations and patient data from whole body PET-MR [12].

Motion correction for PET is still an on-going research area. As the spatial resolution of PET is getting better, accurate motion will be more important for *in-vivo* PET imaging to achieve high effective spatial resolution. Understanding analytical properties of spatial resolution and noise for MCIR methods with unknown motion should be challenging, but interesting future work. Recent studies in anatomical priors (e.g. CT, MR) for PET image reconstruction may pose similar issues on undesirable spatial resolution and noise properties in MCIR methods. Accurate motion estimation is challenging since the image registration problem is nonlinear and nonconvex so that local minima exist. Developing novel regularizers and motion estimation models may be able to further improve the accuracy of estimated motion information. Lastly, simultaneous



The aim is to yield a low-noise PET image from all collected data corresponding to all motion phases using estimated motion information between different motion phases. MCIR methods have been actively investigated for the last 20 years. There are mainly three different mathematical models for MCIR: the first method is to estimate motion from noisy PET images, to align all gated images using estimated motions, and to sum all aligned PET images to yield a motion-corrected PET image with low noise [4]. The second approach is to incorporate a motion model into the statistical framework for PET measurements and to derive an image reconstruction algorithm based on that model [5]. The last method is to devise a temporal regularizer to encourage aligned adjacent gated PET images to be the same [6].

We investigated analytical forms of the noise variance of three different MCIR models to see which method has the best noise property. Since noise properties are heavily dependent on spatial resolution properties (stronger smoothing leads to lower noise), we first studied the spatial resolution properties of MCIRs under limited circumstances of known motion information. We derived the local impulse responses of MCIRs with a quadratic regularizer and found that both motion and the interaction between likelihood

for this problem and iterative algorithms may provide noisy and unrealistic deformations when no proper regularization was used. Quadratic penalty functions based on an elastic deformable motion model were often used in many MCIR methods [4, 5, 6], but they may not be flexible enough to describe large deformations of cardiac and respiratory motions. In the image registration field, a diffeomorphic motion model was investigated as an alternative to a smooth motion model. Diffeomorphic motion is invertible and sometimes topology-preserving, which is a more realistic assumption for motion than smooth motion. Some drawbacks of existing diffeomorphic image registration methods in the late 2000's were high computation complexity and large memory requirement. Since MCIR methods deal with multiple pairs of images, it was important for motion estimation methods to be fast and memory-efficient, while flexible enough to describe nonrigid deformable motions. We proposed a B-spline-based fast and memory efficient regularizer that encourages invertible (diffeomorphic) B-spline deformation [9]. This new regularizer yielded more flexible and realistic motion estimation values compared to a quadratic regularizer. Our proposed regularizer was applied to a MCIR method with parametric motion model [5] to jointly estimate PET image and deformable motions [10].

Articles Continued from PAGE 13

PET-MR has not been fully investigated for further development of MCIR methods and it will be interesting to devise new MCIR models to exploit the fact that PET and MR are acquired at the same time.

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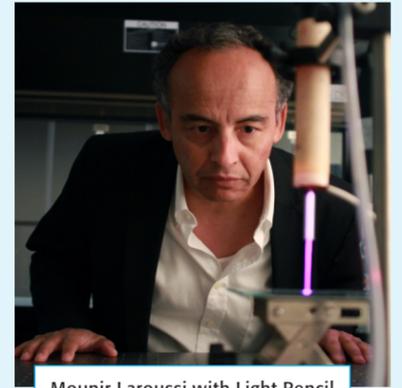
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Plasma's Effects on Cancer

Mounir Laroussi

Resembling a miniature version of Obi-Wan Kenobi's Star Wars light saber, a plasma pencil developed by Mounir Laroussi is used to kill bacteria and sterilize surfaces and could one day become the go-to treatment to kill cancer cells. In 2005, Laroussi, director of ODU's Plasma Engineering and Medicine Institute and professor of electrical and computer engineering, designed the hand-held device that emits a stream of cool plasma. An ODU faculty member since 1999, Laroussi specializes in plasma that can be created at room temperature and used for medicinal purposes, including dental and wound treatment.



Mounir Laroussi with Light Pencil

Known as one of the four states of matter along with solids, liquids and gases, plasma is produced when gas is heated or subjected to a strong electromagnetic field. "Plasma is usually generated in an enclosed chamber," Laroussi explains. "We wanted to get it in the air, and this [pencil] design allowed for that. We can shoot a beam of plasma that's safe to the touch and apply it on tissues, wounds and use it to sterilize surfaces."

Laroussi began investigating plasma's effects on cancer cells in 2010. It's a brand-new field, with most researchers building scientific knowledge, while a group in Germany has begun doing clinical trials on head and neck cancer patients. "We're trying to understand what plasma does to cancer cells so we can optimize the process and make it more efficient," he says. "We're getting very, very encouraging results where plasma kills cancer cells without hurting healthy cells."



Microscopy image of dead cancer cells

more than 90 percent of leukemia cells were wiped out when they came in contact with plasma. "It's still in the scientific development stage, but hopefully in the future, plasma will be one of the therapies people use for cancer."

Excerpted from *Virginia Business*, Local focus, global standing, 29 June 2016.

Mounir Laroussi can be reached by E-mail at larouss@odu.edu.

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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 October 5th, 2016 for publication in the December 2016 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.