2016 Real-Time Conference
June 6\textsuperscript{th}–10\textsuperscript{th}, in Padova, Italy

This year’s Real-Time Conference will take place from June 6\textsuperscript{th}–10\textsuperscript{th} in Padova (Padua), Italy. Held every other year, this conference brings together experts on real-time techniques from the fields of nuclear and particle physics, astrophysics, plasma and nuclear fusion, space science, accelerators, medical imaging, nuclear-power instrumentation, and other radiation instrumentation. We are pleased to offer two interesting short courses taught by outstanding instructors the Sunday before the conference starts (June 5\textsuperscript{th}), one on FPGA and GPU programming by Mariano Ruiz, and one about “Real-time data visualizations and control using modern web technologies” by Stefan Ritt.

Over the years, the Real-Time conference has gained a reputation as a first-rate scientific venue for many different fields of real-time applications. Following a long tradition, there are only plenary talks and poster sessions. Each poster presenter has the opportunity to give a two-minute mini-oral “teaser summary” of the poster. These mini-ors make it easier for attendees to select the posters that most interest them. This is also a great educational opportunity for young participants to present and promote their work in front of a supportive audience.

We selected Padova for its wonderful Italian charm and flair with a number of nice hotels for every taste and budget, its proximity to places such as Venice, but also for its state-of-the-art conference facilities to support a pleasant and high-quality scientific meeting. The conference is hosted by the “Consorzio RFX” under Conference Chair Adriano Luchetta. The conference will be held at the “A. Luciani” Padua Congress Center, which is the most versatile and spacious event venue in Italy’s Northeast.

Please visit the conference web site at https://indico.cern.ch/e/rt2016 for further information. Early registration closes April 22\textsuperscript{nd}. We are looking forward to seeing you in Padova.

Martin Purschke, chairman of the Computer Applications in Nuclear and Plasma Sciences can be reached by E-mail at purschke@bnl.org.

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2016 IEEE Nuclear and Space Radiation Effects Conference, Portland, Oregon July 11\textsuperscript{th}–15\textsuperscript{th}

The 53\textsuperscript{rd} IEEE Nuclear and Space Radiation Effects Conference will be held July 11\textsuperscript{th}–15\textsuperscript{th}, 2016, at the Oregon Convention Center, Portland, Oregon. The conference hotel is the DoubleTree hotel, near the convention center. The General Chair is Robert Reed, Vanderbilt University. 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 11\textsuperscript{th}, a Radiation Effects Data Workshop, and an Industrial Exhibit.

The Technical Program Chair is Philippe Paillet, CEA. He and his technical committee will select contributed papers that describe the effects of radiation on electronic or nuclear materials.
Dear Colleagues,

We are pleased to announce the 2016 IEEE Nuclear Science Symposium and Medical Imaging Conference (2016 NSS/MIC). In addition, and keeping with tradition since 2001, the 23rd Symposium on Room Temperature X-ray and Gamma-ray Semiconductor Detectors (RT2016) will be collocated with the 2016 NSS/MIC. The conference will be held at the Strasbourg Convention Center (Palais de la Musique et des Congrès) in Strasbourg, France. Authors are invited to present their latest developments, describing original, previously unpublished work pertaining to the topics listed on the website.

The IEEE Nuclear Science Symposium ( NSS) offers an outstanding educational and professional networking opportunity for scientists and engineers in the fields of nuclear science, radiation detection, high-energy physics and astrophysics, large-scale research facilities, security, energy, and related instrumentation and software. The scientific program provides a comprehensive review of the latest developments in technology, covering a wide range of applications from radiation instrumentation and new detector materials to complex detector systems for physical sciences. The NSS program consists of parallel, poster, and session papers.

The IEEE Medical Imaging Conference (MIC) is the leading international scientific medical imaging meeting bringing together a broad community interested in the physics, engineering, and mathematical aspects of medical imaging. As the field rapidly evolves towards interdisciplinary, multimodality approaches, the topics covered in the conference range from nuclear medicine (SPECT and PET) to X-ray, CT, optical, MR imaging, and their combination. In parallel, developments in radiopharmaceutical instrumentation and associated treatment and dosimetry protocols, including the combination of imaging and radiation therapy, are continuously gaining ground. The MIC program format consists of oral and poster sessions.

The 21st International Symposium on Room Temperature Semiconductor Detectors (RTSD) represents the latest forum of scientists and engineers developing new semiconductor radiation detectors and imaging arrays. Semiconductor detectors for X-ray, gamma ray, and neutron radiation are increasingly finding applications in diverse fields such as medicine, homeland security, nonproliferation, astrophysics, and environmental remediation. The objective of this symposium is to provide a forum for discussion of the state-of-the-art in the detection of wide band gap semiconductors for radiation detection, including crystal growth, materials and detector characterization, device fabrication processes, low-noise electronics for readout, and applications.

In addition to this broad portfolio of session topics, various joint NSS, MIC, and RTSD sessions will cover hardware topics of mutual interest to all three communities, and a broad selection of relevant referee-focused and short courses will cover specialized, timely topics. Vendors with products and services related to the NSS, MIC, and RTSD are invited to participate in the Industrial Workshop which comprises an exhibition, an integrated program of technical seminars, and an Academia-Industry Matching Forum.

Grants to support attendance at the conference and short courses will be available due to the generous support of individuals, agencies, and industrial sponsors. In addition, several IEEE grants such as the Paul Phillips Continuing Education Grants, Valentin T. Jordanov Travel Grants, and the Conference Trainee Grants will also be available. Specific requirements and application details can be found on the conference website: http://www.nss-mic.org/2016.

Strasbourg is a beautiful location with endless opportunities for discovery and entertainment. A truly European location, the home of the Council of Europe and the European Parliament, with a past dating back 2000 years, and with exceptional architecture and cultural history, provides ample opportunities for enjoyment. Being located close to the border of Germany and having flavors of both countries, the city’s magnificent Cathedral, “La Petite France” – the typical quarter loved by tourists, and its UNESCO World Heritage Site – Grande-Ile, as well as the Alsace region, among many, attracts not to be missed by conference participants.

I know that I speak for the entire organizing committee when I say that we look forward to your contributions and participation in the 2016 NSS/MIC.

Robert Reed
General Chair

NSREC 2016
Portland, Oregon

President’s Report

2016 is a new year, and we look forward to our 2016 conferences, new and improved publications, and our new Access members and technical committee chairs elected last autumn.

Conferences

Upcoming NSS conferences for 2016 include the Symposium on Radiation Measurement and Applications (SORMA) to be held 22nd—27th May 2016 in Berkeley, CA USA. SORMA will focus on homeland security and national security applications. For more information on SORMA, see http://sormaweb.org. The 20th Real-Time Conference (RT2016) will be in Padova, Italy 4th—10th June 2016. RT2016 comprises applications of Real-Time techniques in fields ranging from plasma and nuclear fusion to nuclear physics and astrophysics, space science, accelerators, medical physics, nuclear power instrumentation, and other topics of radiation instrumentation. You can learn more about RT2016 from the cover story or go to http://neco.aps.org/ aert/0901. Next up is the International Conference on Plasma Science (ICOPS), held 19th—23rd June 2016 in Banff, Alberta, Canada. The ICOPS meeting includes basic plasma physics, strongly coupled plasmas, biomedical plasmas, plasma microwave interactions, microwave devices, pulsed power, fusion, beams, and many other topics. You can learn more about the ICOPS conference at http://icops.confex.com/ icops/2016/homepage. The International Power Modulator and High Voltage Conference will be held in San Francisco 6th—8th July 2016, sponsored by the Electronic and Electrical Insulation Society (CEIS). You can learn more about the EPHC at http://www.ephm.vhic.org/2016. The 2016 Nuclear and Space Radiation Effects Conference (NSREC) will be held 11th—15th July 2016 in Portland OR. You can learn more about the NSREC under the Conferences section of this Newsletter or at http://nsrec2016.aps.org/comingsoon. Finally, the largest NSS meeting is the Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), which will be held in Strasbourg, France. You can find more details at CONFERENCES or online at the temporary web site http://nss-mic.org/2016. As always, I encourage you to visit the conference website: http://www.nss-mic.org/2016. The 2016 North American Particle Accelerator Conference will be held in Chicago, IL USA from the 9th—14th October 2016, focusing on accelerator science and technology. Currently a temporary web site provides some basic information about the conference: http://napa2016.aps.anl.gov/ComingSoon.html. Finally, the latest NSS meeting is the Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), which will be held in Strasbourg, France. You can find more details at CONFERENCES or online at the temporary web site http://nss-mic.org/2016. As always, I encourage you to visit the conference website: http://www.nss-mic.org/2016. The 2016 North American Particle Accelerator Conference will be held in Chicago, IL USA from the 9th—14th October 2016, focusing on accelerator science and technology. 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Radiation and Plasma Medical Science (TRPMS) Phase II proposal has been approved by the Technical Activities Board (TAB) that oversees the IEEE Societies and Councils, and by the IEEE Board of Directors, with the help of our partners, the Engineering in Medicine and Biology Society (EMBS). The next steps will include putting together the Steering Committee, and building an editing team including an inaugural editor-in-chief. The journal should publish its first issue a year from now.

IEEE CONSTITUTIONAL AMENDMENT

Controversy continues to rage around the issue within the IEEE Board of Directors to improve its operational efficiency and strategy by reorganizing IEEE. An attempt last June at a Constitutional amendment, at a Constitutional amendment, that we weren’t aware of until the spring, was withdrawn before going out to the membership for vote. At the November 2015 Directors meeting, the Board approved moving forward with a different proposal revision to the IEEE Constitution. This latest revision, developed by the IEEE 2030 Committee, which consists of select Directors, was described to the Society Presidents several weeks in advance for comment and discussion. The proposed amendment can be viewed here: https://www.ieee.org/documents/constitution_amended_proposal.pdf

The primary goal is to separate the Board of Directors role from the Delegate to the Assembly role. In implementation this could mean a much smaller board with less complete geographic and/or Society/Council representation. The details of what this will really mean will be developed in separate Bylaws, which have not yet been drafted, as was the problem with the original attempted Constitutional amendment last summer. This is designed to solve the underlying problem that many on the Board lack experience in areas they are asked to debate and vote on, and that the size of the board leads to inefficient use of time in Board meetings. While many of these issues appear to me (and many others) to be addressable by better leadership, and setting and education of Board members, the proposed amendment could also make that path easier. I have two key concerns about this amendment as presently constructed:

1. It relies on unarticulated bylaws. Before supporting the amendment, I would insist on seeing and understanding the bylaws through which it will be implemented. These could range from beneficial to changing the very nature of the IEEE by removing volunteer control.

2. The present reorganization shown by the IEEE 2030 Committee separates the strategy part of IEEE (as a separate committee from the proposed Executive Board), effectively demoting the Technical Activities Board (TAB), and hence all societies and councils, one level in IEEE. This is especially odd since TAB generate about 80% of all IEEE revenues, directly or indirectly.

Next, the Board has until early summer to define the bylaws through which this will operate. Assuming the Board chooses to move forward with the Amendment, they would put it on the ballot next September, where it must receive 3/5 affirmative vote by at least 10% of the membership. Alternatively, they could choose to pull the amendment from the ballot in the June meeting. Stay tuned and we will continue the discussion in the next NPSS Newsletter, we will keep you informed of this develops, and try to explain what we understand to be the implications.

Sincerely,

John Verbiconce, NPSS President

New AdCom Members

Monica Blank

Monica Blank received the B.S. degree (Electrical Engineering) from the Catholic University of America, Washington, D.C. in 1988, and the M.S. and Ph.D. degrees (Electrical Engineering) in 1991 and 1994, respectively, from the Massachusetts Institute of Technology, Cambridge, MA. In 1994 she joined the Vacuum Electronics Branch of the Naval Research Laboratory, where she was responsible for the design and demonstration of high-power millimeter-wave vacuum electronic devices for radar applications. In 1999 she joined the gynont group at Communications and Power Industries (formerly Varian) where she continues her work on high-power millimeter-wave gynont amplifiers and oscillators. Dr. Blank has received several professional awards, including the 1998 Alan Berman Publication Award at the Naval Research Laboratory, the Robert L. Woods Award for Excellence in Vacuum Electronics Technology in 1999, and an R&D 100 Award in 2015. Dr. Blank has previously served three terms on the IEEE Plasma Science and Applications Executive Committee, and was a Senior Editor for the IEEE Transactions on Plasma Science from 2009–2015.

Ralf Engels

Ralf Engels (M’98, SM’12) is a member of the detector group at the Central Institute of Engineering, Electronics and Analytics, Electronic Systems (ZEA-2) of the Forschungszentrum Jülich. His basic fields of research are the development, construction, and operation of advanced detector systems for thermal neutrons. After his study in electronic design at the Aachen University of Applied Sciences, he wrote his diploma thesis in the detector group (1994) followed by the Ph.D. (2012) at Albert-Ludwigs-Universität Freiburg. He worked as staff engineer in this group and contributed to projects in other departments. In addition to the neutron detector developments, he was also involved in designs for biological detector systems and medical detector systems such as the TierPET (Animal PET) system. He has close collaborations with companies and universities working in the nuclear instrumentation field. His other activities include the design of detector readout electronics and DAQ systems.

From 2004-2014, he has been head of the "Neutron- and Gamma-Detector" group and now he is project manager for neutron detectors. Recently, he was in charge of the development of alternatives to neutron labs world-wide as well as academic researchers, doing well. This has taken vigilance and major budget adjustments in many cases to ensure that conferences weren't lower losses, have not reached break-even or a bit better. Our publications also continue to do well and we are pleased that the time next week we expect our inaugural, IEEE-Transactions on Radiation and Plasma Medical Science (TRPMS), to have issued at least its inaugural volume. Watch for it! This is an exciting time for our MIC and Plasma Medicine communities.

ADCOM ACTIONS

• The Fusion TC requests that the Princeton Plasma Physics Lab be allowed to be a technical cosponsor of the 2017 Symposium on Fusion Technology to be held in Shanghai. While this motion carried, it has subsequently been disallowed by powers beyond NPSS control.

• FinCom moves that NPSS donate $15,000 to the IEEE Foundation in support of the IEEE History Center to update the history of IEEE from 1984 to the present. Motion carried.

• FinCom moves that NPSS support the National Council on Radiation Protection (NCRP) at the annual rate of $1000. Approved. Randy Bill (Vanderbilt) will serve as our NCRP liaison for 2015 and for as long as feasible.

• FinCom moves that the T-PRMS subscription will be added to the NPSS Membership benefits beginning in 2017 as shown in the table below.

The current journal pricing is unchanged. The motion carried.

Secretary’s Report

At the November meeting-year end reports were given by many of our technical and functional committee chairpersons and by our liaisons to other IEEE and relevant non-IEEE activities. Due to extreme care by conference organizers, our conferences are, even in those marginal economic times with heavy government travel restrictions, impacting important labs worldwide as well as academic researchers, doing well. This has taken vigilance and major budget adjustments in many cases to ensure that conferences weren't lower losses, have not reached break-even or a bit better. Our publications also continue to do well and we are pleased that the time next week we expect our inaugural, IEEE-Transactions on Radiation and Plasma Medical Science (TRPMS), to have issued at least its inaugural volume. Watch for it! This is an exciting time for our MIC and Plasma Medicine communities.

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TFM $53 $27 $74 $37 $69 $45

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New HdCom Members

Andreas Neuber

Dr. Andreas A. Neuber, PE, is the distinguished PIV-Horn Professor and the AT&T Professor of Electrical and Computer Engineering at Texas Tech University. He also serves as Co-Director of the Center for Pulsed Power and Power Electronics. Dr. Neuber received his diploma in physics and Dr.Eng. in mechanical engineering from the Darmstadt University of Technology, Germany in 1990 and 1996, respectively. He has authored 14 peer-reviewed journal articles and more than 200 conference proceedings papers. His current research interests are in high-power switching, high-power microwaves, ultrasonic surface flaw detection, and explosive-driven pulsed power. Dr. Neuber has served in various capacities on the organizing committees of numerous international conferences, including Technical Committees of several IEEE Conferences and Technical Symposiums.

Paul Marsden

Chair, Nuclear Medical and Imaging Technical Committee

The 2015 IEEE NSS/PAC Conference on Medical Imaging Conference (NMC/MIC) was held at the Crown and Country Resort in San Diego from the Saturday 31st of October to Sunday the 2nd of November. The meeting was a great success—out of a total of 516 abstracts that were submitted to the NMC program, 104 and 359 were accepted for oral and poster presentations, respectively representing a rejection rate of 11%. Joint sessions, including NMC/MIC, NMC-RTOC, NMC-MICRTOC sessions, were organized from the Tuesday through to Thursday. A program of short courses included in the first half of the week, and a series of early morning refresher courses preceding an up-to-date review of topical subjects prior to the relevant sessions were also very well received. I would like to congratulate Alfonso Acciaio (MIC Program Chair), Lawrence McDonald (MIC Program Deputy Chair) and everyone else involved for providing an excellent program and a very enjoyable meeting.

At this year’s meeting we honored the work of two of our colleagues. Mike King from the University of Massachusetts received the Edward J. Hoffman Medical Imaging Scientist Award “for contributions to clinical nuclear medicine imaging, especially compensation for realistic physical effects and motion in image reconstruction, emission and transmission imaging geometries, and task-based evaluation methods.” Se Young-Chun from USTIST, Korea received the Bruce Haisgave Medical Imaging Conference Young Investigator Award “for contributions to image reconstruction methods in the presence of object motion.” I extend my congratulations to both of them for their success. I would like to take this opportunity to encourage all of you to think of worthy colleagues you can nominate for the next two awards above. (the deadline is 15th of July — see http://ewh.ieee.org/soc/nps/nmisc/). Please send your nominations to the NMC/IMC Awards Chair Matt Weis (matt@bwiathlete.co).

Ronald Schimpf

Ron Schimpf received B.E. (1981), M.E.E. (1984), and Ph.D. (1986) degrees from the University of Minnesota. He was a faculty member at the University of Arizona from 1986-1996, where he served as Assistant Professor, Associate Professor, and Professor. Ron has been at Vanderbilt University since 1996, where he serves as the Dean Henry Ingram Professor of Engineering and Director of the Institute for Space and Defense Electronics. Ron has been involved with NSREC since 1987, serving as General Chair, Technical Chair, Awards Chair, Short Course Chair, Short Course Speaker, Session Chair, and Guest Editor. He also served as Chairman of the Radiation Effects Steering Group. At Vanderbilt, Ron has received the Chancellor’s Cup, the Harvey Bronscob Distinguished Professorship Award, the School of Engineering Outstanding Teaching Award, and the Chancellor’s Award for Research.

Ronald Schimpf

Chair, Conference of 2019, Radiation Effects

References

Bryan V. Oliver

Bryan V. Oliver was born and raised in Berkeley, California USA. He received the B.S. degree in physics from the University of California at San Diego (UCSD) in 1986 and the M.S. and Ph.D. degrees in theoretical plasma physics from Cornell University, Ithaca, NY in 1991 and 1994, respectively.

Dr. Oliver is a Deputy Director in the Radiation and Electrical Sciences Center at Sandia National Laboratories where he leads the Radiation Effects Sciences and Applications Group. His areas of expertise are in theory and simulation of intense electron and ion beam generation and propagation, MHD and electron Hall MHD (EHMHD), 2, 3, and 4, wave (dispersive, Electromagnetic Radiation and Intense Electromagnetic Pulse (EMP), it leads the Sandia effort to develop and apply intense radiation sources for use in the study of radiation effects on devices, circuits and components in hostile radiation environments. This includes the development of large-scale radiation transport and plasma simulation codes as well as high radiation experimental platforms.

Dr. Oliver is a member of the American Physical Society and the Institute for Electrical and Electronics Engineers and serves on the IEEE Pulsed Power Sciences and Technology Committee, the Plasma Science and Applications committee and the International High-Power Particle Beams committee.

Technical Committees

NUCLEAR MEDICAL AND IMAGING SCIENCES

Dr. Dr. Oliver is a member of the American Physical Society and the Institute for Electrical and Electronics Engineers and serves on the IEEE Pulsed Power Sciences and Technology Committee, the Plasma Science and Applications committee and the International High-Power Particle Beams committee.

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**Functional Committees**

**AWARDS**

**Class of 2016 NPSS Fellows**

The IEEE offers Institute Awards, and most Societies and Societal Technical Committees also offer awards. Election to IEEE Fellows is a prestigious honor awarded each year to no more than 0.1% of the full membership by the Institute’s Board of Directors. Nominations are forwarded to the Institute’s Fellow Committee who then recommend a list of candidates to the IEEE Board of Directors for their consideration. The Nuclear and Plasma Sciences Society is justifiably proud of its Fellows. We present here the Class of 2016 Fellows, and wish them each our heartfelt congratulations. Editor’s note.

**Bruce Carlsten**

Bruce Carlsten is an accelerator physicist and RF engineer at the Los Alamos National Laboratory (LANL). He received a B.S. in Physics and a B.A. in Mathematics from UCLA in 1979, and an M.S., Degree of Engineer, and Ph.D. in Electrical Engineering from Stanford University in 1980, 1982, and 1985, respectively. He joined LANL in 1982 and since then has worked on a variety of high power accelerator and RF source projects. He was a pioneer in the development of RF photoreactors and is credited with the development of the emittance compensation technique which has allowed photoreactors to generate exceptionally bright electron beams. He was also a pioneer in the development of bunch compressors, including on novel Free-Electron Laser and Wirebond RF source technologies as well as novel segmented aperture (SAR) imaging schemes.

Dr. Carlsten is also a Fellow of the Los Alamos National Laboratory and of the American Physical Society. He is a member on the High Energy Physics Advisory Panel (HEPAP) and of the Advisory Board for the Air Force Office of Scientific Research MURI on Transiently Electromagnetics. He is a Member-at-Large of both the Executive Committee of the Division of Physics of Beams of the American Physical Society and of the IEEE Particle Accelerator Science and Technology Technical Committee, and is on the Editorial Board of Physical Review Special Topics—Accelerators and Beams.

**Citation:** For contributions to high-brightness electron beams and vacuum electron devices

**Georges El Fakhri**

Georges El Fakhri is a Professor of Radiology at Harvard Medical School and the founding Director of the Gordon Center for Medical Imaging (GCMI). He also directs the Massachusetts General Hospital (MCH) PET Core, and is Co-Director of the Division of Nuclear Medicine and Molecular Imaging. Dr. El Fakhri is an internationally recognized expert in quantitative SPECT, PET/CT, and PET/MR. He has pioneered novel approaches to compensate for many of the physical factors affecting quantitative SPECT, PET/CT and PET/MR and objectively assessing the achieved improvement in image quality, specifically in PET oncologic, neurologic and cardiac imaging as well as in the development of novel approaches to quantitative cardiac and brain modeling. In SPECT/PET his pioneering work has identified the relative role of different brain structures (e.g., entorhinal cortex, anterior cingulate) in the early onset of Alzheimer’s disease in large cohorts of patients followed over a decade with perfusion SPECT and structural MRI. Recently, Dr. El Fakhri’s lab pioneered some of the early dopamine displacement studies with PET and more recently mapping neurotransmission (e.g., dopamine, serotonin) in normal and severely depressed subjects. He has also pioneered the use of in-room PET for monitoring proton therapy and assessing changes in O-15 washout through kinetic modeling. In the heart, Dr. El Fakhri developed the early kinetic modeling, parametric imaging and quantitative framework for Rb-82 imaging and validated measured absolute myocardial blood. Recent work includes the development of novel approaches to mapping mitochondrial complex I and membrane potential non-invasively in the heart as well as developing synergistic approaches in PET/MR for motion compensation, anatomical priors, PET/MRI and PET/CMR.

**Citation:** For contributions to biological imaging.

**Stuart Kleinfelder**

Stuart Kleinfelder has made many contributions to integrated instrumentations and systems for High Energy Physics, Nuclear Science and Particle Astrophysics. He developed the first custom CMOS circuit for such applications, used in CDF’s silicon vertex detector at the Fermi National Accelerator Laboratory. He invented the Switched Capacitor Array technique of compact, low-power transient waveform acquisition circuits. In the early 1990s these SCAs achieved 11–13 bits of dynamic range and up to 5-6G samples/sec, for exceeding the PET of the day while using ten times less power. Today, the basic SCA technique is a ubiquitous tool used in a great many experiments around the world. For example, one of his versions became the electronic heart of over 5,000 Digital Optical detector: the IceCube experiment in Antarctica.

**Vladimir Kolobov**

Vladimir Kolobov is a Technical Fellow and Manager of Plasma Technologies at CTO Research Corporation in Huntsville, AL, USA. He obtained his Ph.D. degree from Stanford University in 2001 and has authored and co-authored over 140 papers.

**Citation:** For contributions to sensors and instrumentation for high-speed imaging applications.

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**Early Research in the Effects of Coherent Synchronization Radiation:**

Early research in the effects of coherent synchronization radiation. He built and commissioned two beam- physics research accelerators at Los Alamos (ATOP and THOR). He led early research in annular relativistic Magnetohydrodynamics physics, in the generation and transport of high-aspect-ratio elliptical beams, and in planar slow-wave structures for high-power, high-bandwidth RF amplification at W-band. He led LANL’s High-Power Electronics Group from 2005 to 2012 and is now an R&D Engineer focusing on novel Free-Electron Laser and Wirebond RF source technologies as well as novel segmented aperture (SAR) imaging schemes.

Dr. Carlsten is also a Fellow of the Los Alamos National Laboratory and of the American Physical Society. He is a member on the High Energy Physics Advisory Panel (HEPAP) and of the Advisory Board for the Air Force Office of Scientific Research MURI on Transiently Electromagnetics. He is a Member-at-Large of both the Executive Committee of the Division of Physics of Beams of the American Physical Society and of the IEEE Particle Accelerator Science and Technology Technical Committee, and is on the Editorial Board of Physical Review Special Topics—Accelerators and Beams.

**Citation:** For contributions to high-brightness electron beams and vacuum electron devices

**Georges El Fakhri**

Georges El Fakhri is a Professor of Radiology at Harvard Medical School and the founding Director of the Gordon Center for Medical Imaging (GCMI). He also directs the Massachusetts General Hospital (MCH) PET Core, and is Co-Director of the Division of Nuclear Medicine and Molecular Imaging. Dr. El Fakhri is an internationally recognized expert in quantitative SPECT, PET/CT, and PET/MR. He has pioneered novel approaches to compensate for many of the physical factors affecting quantitative SPECT, PET/CT and PET/MR and objectively assessing the achieved improvement in image quality, specifically in PET oncologic, neurologic and cardiac imaging as well as in the development of novel approaches to quantitative cardiac and brain modeling. In SPECT/PET his pioneering work has identified the relative role of different brain structures (e.g., entorhinal cortex, anterior cingulate) in the early onset of Alzheimer’s disease in large cohorts of patients followed over a decade with perfusion SPECT and structural MRI. Recently, Dr. El Fakhri’s lab pioneered some of the early dopamine displacement studies with PET and more recently mapping neurotransmission (e.g., dopamine, serotonin) in normal and severely depressed subjects. He has also pioneered the use of in-room PET for monitoring proton therapy and assessing changes in O-15 washout through kinetic modeling. In the heart, Dr. El Fakhri developed the early kinetic modeling, parametric imaging and quantitative framework for Rb-82 imaging and validated measured absolute myocardial blood. Recent work includes the development of novel approaches to mapping mitochondrial complex I and membrane potential non-invasively in the heart as well as developing synergistic approaches in PET/MR for motion compensation, anatomical priors, PET/MRI and PET/CMR.

**Citation:** For contributions to biological imaging.

**Stuart Kleinfelder**

Stuart Kleinfelder has made many contributions to integrated instrumentations and systems for High Energy Physics, Nuclear Science and Particle Astrophysics. He developed the first custom CMOS circuit for such applications, used in CDF’s silicon vertex detector at the Fermi National Accelerator Laboratory. He invented the Switched Capacitor Array technique of compact, low-power transient waveform acquisition circuits. In the early 1990s these SCAs achieved 11–13 bits of dynamic range and up to 5-6G samples/sec, for exceeding the PET of the day while using ten times less power. Today, the basic SCA technique is a ubiquitous tool used in a great many experiments around the world. For example, one of his versions became the electronic heart of over 5,000 Digital Optical detector: the IceCube experiment in Antarctica.

**Vladimir Kolobov**

Vladimir Kolobov is a Technical Fellow and Manager of Plasma Technologies at CTO Research Corporation in Huntsville, AL, USA. He obtained his Ph.D. degree from Stanford University in 2001 and has authored and co-authored over 140 papers.

**Citation:** For contributions to sensors and instrumentation for high-speed imaging applications.

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**Andreas Neuber**

Andreas Neuber, Chair of the Pulsed Power Science and Technology Committee can be reached at Texas Tech University, Department of Electrical and Computer Engineering, Box 43102, Lubbock, TX 79409; Phone: +1 806 834-8270; E-mail: a.neuber.dr@ieee.org.
**2015 IEEE Nuclear and Space Radiation Effects Conference Awards**

It is a longstanding tradition of the IEEE Nuclear and Space Radiation Effects Conference to honor the Outstanding Conference Paper and the Outstanding Data Workshop Presentation. In recent years recognition has also been given to the best paper presented and first-authored by an IEEE Student Member. The awards process not only rewards authors for particularly high quality and impact work, but also encourages all authors to produce presentations and manuscripts of high technical quality, clarity of presentation, and significance to the community.

Although there were a number of strong candidates for the Outstanding Conference Paper, two papers stood out due to their high scores across committee members. When two papers stand out from the others, a Meritorious Paper Award can be given in addition to the Outstanding Conference Paper Award. This was the case this year.

**IT IS OUR PLEASURE TO ANNOUNCE THE FOLLOWING 2015 NSREC AWARD WINNERS:**

**OUTSTANDING CONFERENCE PAPER**


**MERITORIOUS CONFERENCE PAPER**


**OUTSTANDING STUDENT PAPER**


**OUTSTANDING DATA WORKSHOP—CO-WINNERS**


**CHAPETERS AND LOCAL ACTIVITIES**

Chapters are local units of the IEEE that are established in Sections, but are affiliated with one or more IEEE Societies. Student branch chapters are formed within IEEE student branches at colleges, universities, or technical institutes, and are also affiliated with IEEE Societies. Chapters of both types sponsor local activities, including workshops, seminars, guest lectures, and social gatherings, and provide networking and leadership training opportunities for their members. The NPSS has an active chapters program, with 22 chapters and joint chapters around the world, including two student branch chapters. Their locations are shown by IEEE Region in the accompanying map. Two new NPSS chapters were formed in 2015. The first, a student branch chapter, was established at the Velkore Institute of Technology in Tamil Nadu, India on February 23rd, 2015. Its current president, Pranjal Jain and Kishore Agarwal, were the first recipients of the newly established NPSS Chapter Founder’s plaque, which was presented via video recording by the NPSS President, John Vienett. The second new chapter was formed on June 4th, 2015 in the Southeastern Michigan Section. Its founder, David Greens, also received an NPSS Chapter Founder’s plaque. He was assisted by Kimball Williams of the Section, and by NPSS members at the University of Michigan and Michigan State University. A list of the current NPSS chapters can be found on our chapters webpage http://ieee-npss.org/chapters/. The NPSS provides support for its chapters through its Distinguished Lecturers program, and can also provide direct financial assistance to support chapter activities.

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**HENCE, OUR LOSS**

Under democracy every party always devotes its energies to trying to prove that the other party is unfit to rule and both commonly succeed and are right.

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**ALAS, THE IMMOVABLE OBJECT**

Love is an irresistible desire to be irresistibly desired.

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**NEW NPSS PUBLICATIONS**


**SOMETHING TO CHEW ON**

Age and youth have the same appetites, but not the same teeth.

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**NPSS NEWS**

Teresa Farris  RE Vice Chair-person of Publicity

Nathaniel Dodd  NPSS Outstanding Paper Award Recipient

**FUNCTIONAL COMMITTEES CONTINUED**

NPSS News

Steve Gold  Chapters and Local Activities Chair

Teresa Farris  RE Vice Chair-person of Publicity

Functional Committees

**NPSS NEWS**

Kolhör has made unique contributions to the advancements of plasma science and its industrial applications. He has developed a kinetic theory of glow discharges (in collaboration with Jesper Treadwell) that explained the complicated structure of the cathode region and the nature of electric field reversals therein. He has developed a kinetic theory of low-pressure inductively coupled plasma that describe the collisionless electron heating and formation of electron density distribution function under conditions of the anomalous skin effect. He is the author of over 60 journal articles and numerous conference presentations. Dr. Kolhör is a recipient of the 2015 IEEE Region 3 Outstanding Engineer Award for distinctive contributions to plasma science through advances in theory and through the development of computational tools.

Citation: For contributions to theory, simulation and software development for industrial plasma.

Stefan Ritt

Stefan Ritt received his Ph.D. in physics from the University of Karlsruhe, Germany in 1993. He is currently head of the plasma physics group at Paul Scherrer Institute (PSI), Switzerland, where he works in the lab’s particle physics program involving experiments with muons and pions.

Among Dr. Ritt’s many recognized contributions to such areas as the MDMS data acquisition system and the Elgg electronic logbook, the one with the most outstanding impact is his design of the switched capacitor array chip, named “Domino Ring Sampler” (DRS). This chip has had a major impact on instrumentation design in High Energy, Nuclear and Particle physics, as well as Medical Imaging and diagnostics. The current version of the chip, DRS8, is capable of digitizing electrical signals with eight channels simultaneously with a sampling rate of two billion samples per second and 12 bits of resolution, at a power requirement of only 30 mW per channel, outperforming any commercial analog-to-digital converter. A novel timing calibration has been developed recently with researchers from the University of Tübingen, Germany, which allows the chip to measure time differences between two signals at an accuracy better than one picosecond, which is currently the record for chips of this kind. The chip is therefore an enabling technology for many experiments such as the MEG experiment at PSI, which utilizes more than 3000 channels. The chip has been distributed through PSI’s technology-transfer program to more than 200 groups worldwide, including the Cherenkov Telescope Array (CTA), which is the next generation of ground-based, very-high-energy gamma-ray observatories.

Dr. Ritt has been an active member of IEEE for many years. He is currently the NPSS vice president / president elect.

Citation: For the development of the Domino Ring Sampler series of chips.

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NPS NEWS

Functional Committees

HIGHLIGHTED CONTENT IN TNs AND TIPS

We have instituted broadcast emails when an issue of the Transactions on Nuclear Science (TNS) or the Transactions on Plasma Science (TPS) is published. These emails highlight articles in that issue that the editorial team has identified as being of broad interest to the community. The highlighted articles are made available in their entirety to readers free of charge (no subscription required to read the complete article), typically for a limited time. Following a summary of these highlighted articles is the full Table of Contents for the current issue of the journal. Highlighted links in the Table of Contents will take you directly to each article in IEEE Xplore. We hope that recipients find the emails a useful tool to help identify new content of interest in the journals.

If you are not receiving either of these emails and would like to be added to the email list, please send a note asking to subscribe to the email blast for the publication you are interested in. That email should be sent to tip-editor@ieee.org for subscription to the TNS email blast, and to tips-editor@ieee.org for the TPS email blast.

TOUGH REQUIREMENT

All you have to do on television is to be yourself, provided that it, you have a self to be.

Clive James

EAB Education Liaison Report

IEEE EXHIBITS PROGRAM STRATEGIC SUMMIT

Since 2010 the Educational Activities Board (EAB) has explored opportunities to create impact within formal education systems by developing a variety of hands-on science center exhibits. The goal of these exhibits is to encourage interest in engineering, technology, and computing and associated careers among pre-university students, their teachers, and the public, while heightening visibility of the IEEE brand. These exhibits were developed through two grant-funded initiatives, IEEE E-Schools and the IEEE-Griffiths Fund.

CONTINUING AND PROFESSIONAL EDUCATION OPPORTUNITIES

Through collaboration with other areas of Educational Activities and IEEE, and the support of external partners, the Continuing and Professional Education team of volunteers and professional staff continues to create innovative offerings that serve the needs of engineering, computing and technology professionals globally.

IEEE

Following a successful run of the “Introduction to Cloud Computing” massive, open, online course (MOOC) earlier in the year, which attracted more than 35,000 learners from 180 countries, IEEE launched a second run of the course on 12th November. More than 17,000 learners from 176 countries participated in the course.

In December, IEEE will launch “Managing a Multigenerational and Diverse Workforce” in conjunction with the Rutgers University School of Management and Labor Relations. The course teaches managers and employers how to effectively lead their human capital under the “new normal” demographic and global trends shaping labor markets.

To learn more about IEEE, and to enroll in a future course, visit www.ieee.org.

IEEE COURSES

Following a successful migration onto the IEEE Xplore platform earlier this year, IEEE Courses has aggressively expanded in recent months. For example, there were over 6,000 courses launched in July 2015—a dramatic increase from the previous monthly average of less than 500 course launches.

Analysts demonstrate that topics such as cloud computing, software engineering and transportation continue to be in demand. In addition, the Continuing and Professional Education team is developing courses on other hot topics, including big data, the Internet of things and cybersecurity.

To discover the new IEEE Courses interface, and to access content, visit http://ieeecourses.ieee.org/courses/home.

Learn about the latest developments in the EAB by visiting http://eab.ieee.org/education_lms/education/index.cfm?eid=41727099

Eld Schamlikin, the NPS Liaison to the EAB, has compiled a list of Liaison Reports (EAB) can be reached by E-mail at Eld@ieee.org.

Liaison Reports Continued on PAGE 8
In January 2016 Ray and Albe Larsen were invited to attend the Third International Conference on Renewable Energy Use (ICREU) at the Coimbatore Institute of Technology (CIT), Coimbatore, Tamil Nadu, India where Ray was the Chief Guest Speaker tasked with officially opening the conference, giving a keynote address on IEEE Smart Village’s Energy, Education and Empowerment business model and running a half-day Smart Village workshop to teach students and delegates about Smart Village principles of creating and supporting sustainable businesses in remote off-grid or energy-impoverished areas. The students were particularly keen to learn about the program and many of them were already involved in charitable rather than business-model projects, but were eager to see the benefits of the Smart Village approach. In addition several students were keen to learn all they could about Ray’s career in accelerator instrumentation, control and pulsed power systems and Albe’s in magnetic confinement fusion. A particular highlight of the event was meeting Dr. Rama Ramakumar, a professor at Oklahoma State University, an early advocate of renewable energy who extended the invitation; his colleague at OSU Dr. Sundireesh S. Heggia, and our very gracious host Dr. E. Chandira Sekaran, Organizing Secretary (ICREU 2016), Associate Professor of Electrical Engineering at CIT which is reputed to be a top engineering university in India modeled after MIT.

Following the Coimbatore Conference, the Larsens along with Farid Khan, our Smart Village consultant for Southeast Asia, traveled to Bangalore to meet with Director of IEEE India Operations Harish Mysore and his impressive staff at their headquarters for a keynote address on IEEE Smart Village’s Energy, Education and Empowerment business model and running a half-day Smart Village workshop to teach students about Smart Village principles of creating and supporting sustainable businesses in remote off-grid or energy-impoverished areas. The students were particularly keen to learn about the program and many of them were already involved in charitable rather than business-model projects, but were eager to see the benefits of the Smart Village approach. In addition several students were keen to learn all they could about Ray’s career in accelerator instrumentation, control and pulsed power systems and Albe’s in magnetic confinement fusion. A particular highlight of the event was meeting Dr. Rama Ramakumar, a professor at Oklahoma State University, an early advocate of renewable energy who extended the invitation; his colleague at OSU Dr. Sundireesh S. Heggia, and our very gracious host Dr. E. Chandira Sekaran, Organizing Secretary (ICREU 2016), Associate Professor of Electrical Engineering at CIT which is reputed to be a top engineering university in India modeled after MIT.

Overall this very fruitful trip will help develop and solidify partnerships to move the IEEE India program forward, a major objective of IEEE Smart Village for 2016.
Plasma Medicine: Anecdotes From Behind the Scene

By Mourin Laroussi

This is not a technical paper about "Plasma Medicine." A few years ago I did publish a technical write-up in this newsletter about the field [1], but this time I am writing the article to answer a question that I get asked quite frequently: How did you get into doing research on the biomedical applications of plasma? Or sometimes it is phrased more like this: what drove you into using plasma for biomedical applications? The short answer is: interestingly, but this would shed very little light on the subject. So, I must give the particularly interested reader the longer version of the answer.

In 1991 I was finishing a post-doctoral position for Prof. Robert W. Bork (my alma mater). That project was about studying the dielectric strength of an insulator that could then be used to coat high-voltage cables in wireless television sets produced by a company (CBS) that was going out of business, the company was going out of business, and the company wanted to know why and how. The Electrical Engineering Department Chair (the academic department where Prof. Bork and I were located) was rather hesitant to delve into biomedical research. I decided to convert my appointment from post-doc research associate to research assistant professor, an appointment that had already been approved by Prof. Bork. I was very pleased to be approved, but this meant that I could no longer count on being solely supported by a senior professor but I needed to generate my own research and attract external research funding of my own. As many readers will know, that is a lot of pressure. So, for several weeks I kept asking myself what research topic should I tackle. I was thinking "plasmas" for research and "endless." One thing I was sure about: I wanted my research to be different and unique, but what? I had no idea. There were many interesting things I could think of but none would be quite unique.

A couple of years before (around 1991/1992) I was involved in designing and testing a dielectric barrier discharge that generated a diffuse large-volume, atmospheric pressure plasma, which we then used to treat the surfaces of materials such as plastics or denim, mainly to render them more hydrophobic [2] (in the early and mid-1990s this line of research was novel and attracted the attention of the plasma physics community which was reeling from budget cuts in the nuclear fusion program and looking for other applications of plasma that would bear fruits in the short term. Anyway, I thought that picking up such a topic would be a great option for my independent research, but I needed to come up with a "new lead" so a new avenue where such nonelectrokinetic plasmas might be applied. Then, one night it all suddenly came to me as soon as I went to sleep, it was clear: I was going to do my own version of a "plasma" as a kind of research haystack. I mean I was looking for something that would be unique and I found it. I had no idea what these things were called, but I knew that I wanted them to be different, but I had no idea. The next day, I realized that I actually had a new idea and decided to pursue this line of research. I proved that plasma could clean bacteria but I still needed to figure out how and what it would do to other types of cells, such as human cells. But to do this I needed money, funding from someone and I knew exactly who that would be.

Dr. Robert J. Baker (Bob) was a program manager at the Physics and Electronics Directorate of AFOSR. I met him a few years before as he funded my Ph.D. University of Tennessee had an excellent center for environmental biotechnology under the direction of Prof. Gary Saylor, a prominent scientist in this field. So, the first step was to approach the center (which was located off the main campus at the time and met with Prof. Saylor. After explaining to him what I wanted to do, he thanked me for sharing my interesting ideas and told me that he would be in touch. A week passed, two weeks, a month, then two months and I did not hear back from Prof. Saylor. I thought that maybe he was not interested after all and maybe I should look for someone else to help me with my plans. Then, about three months after our meeting, I was in my office when I heard a knock on the door. A student entered my office and informed me that Prof. Saylor’s graduate student and she was ready to offer me any help I needed with my experiments. To make a long story short, we exposed a bacterial culture to plasma (under low temperature and atmospheric pressure conditions) and found that a few minutes exposure killed all the bacterial cells. I knew then that I was on something special. I wrote up my results and submitted them to the IEEE Transactions on Plasma Science. The paper was published in the June issue, 1996 [3]. Not long after the paper came out I got a phone call from none other than Prof. S. Block, who was then Emeritus Professor at the University of Florida. Prof. Block was known as the man "who wrote the book on sterilization and preservation" [4]. I could not believe that Prof. Block knew about my work and that he found it worthy of a phone call! (I never did meet Prof. Block in person.) I remember feeling so honored and thinking that I had continued pursuing this line of research. I proved that plasma could kill bacteria but I still needed to figure out how and what it would do to other types of cells, such as human cells. But to do this I needed money, funding from someone and I knew exactly who that would be.

In 2002, I was a researcher at the Applied Research Center of Old Dominion University (ODU). One day, the phone rang and on the other end of the line was Dr. Asoka Mendis, a well-recognized respected researches at the University of California, San Diego. Dr. Mendis, whom I did not know at the time, told me that he was ready for work on the inactivation of bacteria by plasma and that he had developed a model explaining my experimental observations, based on dusty plasma concepts. I was intrigued and, to make another long story short, Dr. Mendis (with his collaborator, Dr. Marlene Rosenberg) and myself collaborated on a paper that was published in 2005 in the New Journal of Physics (Institute of Physics, IOP). [5]. This paper went more than 4,000 downloads in the first week it appeared online. It was later featured as one of the top papers published by IOP conference I got to meet the famous plasma physicist, Prof. Padma Shukla (Rohry University, Il昌char). We developed a friendship that lasted until his sudden and unexpected death in January 2013 while he was in India to receive the highest honor from the Indian government. Following my talk, Prof. Shukla told me that he was very enthusiastic about the possibility of plasma being used for biomedical applications. Below, to the right, is my picture with Prof. Shukla.

Since the mid-2000s Greg Morfill had been taking the application of plasma in biology and medicine seriously and introduced it to his research group at the Max-Planck-Institute. In 2009 he started organizing a workshop on the topic, held in beautiful Ringberg castle in Bavaria. The workshop was attended by a network of scientists selected by Greg from Russia, Europe, and the U.S. (my lab at ODU, Greg’s group). I attended two of these workshops which were fantastic opportunities to meet like-minded people and exchange ideas. It is important here to mention that Greg’s group conducted the first-ever clinical trial on wound healing by direct plasma exposure in 2010. Prior to these trials, around 2007–2008, my group at ODU did same proof-of-principal experiments on wound healing using a multicellular organism, planaria, which is a noteworthy milestone. In 2008, both Greg and Asoka invited me to present my research work. I proved that plasma could kill bacteria but I still needed to figure out how and what it would do to other types of cells, such as human cells. But to do this I needed money, funding from someone and I knew exactly who that would be.

Fig. 1 Mounir (left) giving Bob Barker a plaque recognizing his early and crucial support to plasma medicine. ICOPS 2010, Norfolk, VA, June, 2011.

Fig. 2 Azores 2008. Left picture: Asoka Mendis (right) and I; Right picture: Padma Shukla and I.
engaging in research on the biomedical applications of low-temperature plasmas. In 2007 Alex and his group coined the short and catchy term "Plasma Medicine" to replace the long term that was used until then which was the "Biomedical Applications of Nonthermal Plasma". In 2008 Alex and I guest-edited the first journal special issue with the specific title “Plasma Medicine” [8]. Also of importance is that in 2007, DPI organized the first International Conference on Plasma Medicine (ICPM) that is dedicated entirely to the field of plasma medicine. Since the late 1990s and early 2000s the topic of the biological and medical applications of nonthermal plasma became increasingly part of many important and well-established plasma conferences (EDPS, IPC, ICPS, ICPQ,…), but did not have its own dedicated conference until the conferences (ICOPS, GEC, ISPC, ICPIG,…), but did not have its own dedicated conference until the year 2007. DPI organized the first International Conference on Plasma Medicine (ICPM) that is dedicated entirely to the field of plasma medicine. Since the late 1990s and early 2000s the topic of the biological and medical applications of nonthermal plasma became increasingly part of many important and well-established plasma conferences (EDPS, IPC, ICPS, ICPQ,…), but did not have its own dedicated conference until the establishment of ICPM in 2007.

To conclude, the above has hopefully given the interested reader a general idea about the advent of plasma medicine with interesting anecdotes of how various individuals played their role to shape the events that helped plasma medicine research taket root. Today a global community of researchers is engaged in this field. Applications ranging from sterilization/decontamination, wound healing, and dentistry are actively pursued by many laboratories in academia and industry. In addition to the experimental work, modelling work on plasma-cells and plasma-tissue interactions has also been attempted recently by Prof. Mark Kushner’s group at the University of Michigan, Prof. David Cazes’ group at UC Berkeley, and Prof. Andriessen Baggen’s group at the University of Antwerp, Belgium. Most importantly and since the mid-2000s, low-temperature plasma has been under investigation as a possible cancer therapy. Many groundbreaking experiments conducted by various research groups showed that plasmas kill cancer cells in a selective manner [10] – [18]. A nonexhaustive list of prominent centers/institutes/universities presently engaged in cancer research is: Nagoya University (Japan), PUP Greifswald (Germany), Technical University of Munich (Germany), University of Antwerp (Belgium), Kwaungwan University (South Korea), University of Kiel, GRIM (France), University of Toulouse, LAPLACE (France), University of Paris and Ecole Polytechnique (France), University of Bologna (Italy), Hualing University (China), The University of York (UK), Queens University (N. Ireland), CSIRO (Australia), University of South Australia, Adelaide, Georgia Tech, University of Delaware (USA), Jefferson University (USA); Old Dominion University (USA); and University of California, Berkeley (USA). The literature also shows that some research activities on the subject are going on in Russia, the Middle East, and North Africa. Recognizing the importance of this work, Prof. Michael K. George (Washington University) and Old Dominion University organized the first International Workshop of Plasma for Cancer Treatment (WPCP) in March 2014. Since then this yearly workshop is becoming the main venue where researchers from around the world who are active in this topic meet, exchange ideas and build collaborations.

REFERENCES