NSREC 2022 Live Provo, Utah
July 18th-22nd, 2022

The location for the 59th NSREC 2022 will be the Utah Valley Convention Center, just 45 minutes south of Salt Lake City in Historic Downtown Provo, Utah. The conference is sponsored by IEEE Nuclear and Plasma Sciences Society (NPSS) with guidance provided by the Radiation Effects Steering Group (RESG). Tom Turflinger, The Aerospace Corporation, is the General Conference Chair, and Robert Reed, Vanderbilt University, is RESG Chair. Corporate supporters of the conference include The Aerospace Corporation, Analog Devices, Boeing, CAES, EMPC, EPC Space, Honeywell, IHI Rail Products, An Infineon Technologies Company, Jet Propulsion Laboratory, LLNL, Radiation Test Solutions, Renesas, SkyWater Technology, and Southwest Research Institute.

The NSREC organizing committee has worked hard to offer an interesting venue and outstanding program for this year’s conference and will continue the tradition of previous Nuclear & Space Radiation Effects Conferences by offering a Technical Program, a Short Course that precedes the technical program, a Radiation Effects Data Workshop, and an Industrial Exhibit. Engineers, scientists, and managers from around the world who are interested in radiation effects will attend.

Please visit the redesigned NSREC website www.nsrec.com for 2022 conference details and travel planning tips.

TECHNICAL PROGRAM
The Technical Program Chair, Pascale Gouker, MIT Lincoln Laboratory, and her committee have assembled an outstanding set of technical papers that are organized into nine oral sessions and a poster session. Papers presented in the NSREC technical sessions are expected to be submitted for publication after the conference in the January 2023 issue of the IEEE Transactions on Nuclear Science (TNS), subject to the standard TNS peer review process. A Radiation Effects Data Workshop is also included in the Technical Program with papers that emphasize data on electronic devices and systems and descriptions of new simulation tools and radiation test facilities. These papers will appear in a non-peer reviewed workshop record. In addition to the contributed papers, three invited talks will be presented that are of general interest to conference attendees and their companions.

NSREC 2022 will have three exciting Guest Speakers whose talks are open to technical attendees and their guests.

» Ultra High Energy Cosmic Rays in Utah
Pierre Sokolsky, Distinguished Professor of Physics and Astronomy Emeritus, University of Utah

» Dinosaurs and other Mesozoic critters of Utah – A trip through Deep Time
Brooks Britt, Chair, Geological Sciences, Brigham Young University, Provo, Utah
**INDUSTRIAL EXHIBIT**

Tara Luther, SkyWater Technology, is the Industrial Exhibit Chair. The exhibit will allow conference attendees to discuss new developments in radiation-hardened and radiation-tolerant electronics, engineering services, facilities, and equipment with participating vendors. If you need more information about the exhibit, please visit [www.npsec.com](http://www.npsec.com) or contact Tara at Tara.Luther@SkyWaterTechnology.com.

**PROVO, UTAH**

Provo is situated in the heart of Utah Valley between the eastern shores of Utah Lake and the towering Wasatch Mountains. Mount Timpanogos dominates the northern part of the city at 11,927 feet (3,644 meters); these rugged mountains east of Provo create one of the most picturesque backdrops in Utah.

The Utah Valley Convention Center is ideally located in the city center and adjacent to the Provo Marriott and Hotel, offering excellent accommodations. Within minutes, you will be in a thriving district where families and business professionals alike can enjoy the colorful scenery, historic buildings, vintage boutiques and over 50 restaurants. Alternatively, one can break on the roof top garden, offering breathtaking views of the Wasatch Mountains without leaving the venue. Come and join us for NSREC 2022 and experience it for yourself.

**ADDITIONAL INFORMATION**

For the latest information on the conference, including the technical program and registration forms, please visit our web site at [http://www.npsec.com](http://www.npsec.com). Alternatively, you may contact the General Chair, Tom Turflinger, E-mail: thomas.l.turflinger@ieee.org. You may contact the Publicity Chair, Teresa Faris, E-mail: teresa.tarsi@carnegic.org.

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**SECRETARY’S REPORT**

The NPSS AdCom met virtually by Zoom on March 4th (Finance Committee, Communications Committee) and 5th (AdCom). As this was the first meeting for our newly elected members and new TC Chairs, President Steve Melkie spent a little time introducing NPSS and AdCom’s role in its operation. He noted that TAB is discussing a multiple society membership discount package, but each of the society must have agreed. The impact on IEE revenue is projected to be a loss of about $375k. The loss to NPSS would be of order $1-2k. A pilot program accelerating partnerships with Chinese journals has begun in response to a Chinese government mandate that at least 1/3 of the papers by a Chinese author must be published in a Chinese journal. NPSS has not joined the pilot program to date. President Steve Melkie also sent a message to the president of the East Ukraine Section Chapter indicating our support for Ukraine in these difficult times.

**NEW WEB PAGE**

A new web page at [http://www.npsec.com/technical-committees/education-committee](http://www.npsec.com/technical-committees/education-committee) which I encourage you to browse. The committee has also established a new form and process to apply for small amounts of funding for educational activities which you will find on the web page. EdCom is already planning several new educational activities over the next 11 months, including a joint school on OpenGATE in Africa, a presentation on NPSS by Stefan at the African School of Physics congress ([https://www.africanschoolofphysics.org/](https://www.africanschoolofphysics.org/)) and two new instrumentation schools in Dakar, Senegal in December 2022 and Viareggio, Italy in June 2023.

This is a snapshot of some of the great work being done by your AdCom on behalf of NPSS. I encourage you to reach out to your TC Chairs and elected members of AdCom to discuss other new initiatives you would like to promote within your technical area.

Steve Melkie, IEEE NPSS President, can be reached by Email at [steve.melkie@sydney.edu.au](mailto:steve.melkie@sydney.edu.au).

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**Conferences Society General Business**

**NPSS NEWS**

**NSREC. Cont. from PAGE 1**

- Utah Rocks!
  Ron Hams, Professor of Geological Sciences, Brigham Young University, Provo, Utah

**SHORT COURSE**

**Sylvain Girard Short Course Chair**

The Short Course Chair is Sylvain Girard, Université of St. Brianne. The theme of the 2022 course is “Multi-Scale, Multi-Physics of Radiation Effects.”

Presentations and speakers for the four sessions are:

- **From radiation environments to radiation-matter interactions**
  Speaker: Giovanni Sardão (ESR)

- **Experimental characterization of radiation effects parameters for device and circuit level modeling**
  Speaker: Philippe Paillet (CEA)

- **Modeling cumulative radiation effects: devices in integrated circuits**
  Speakers: Hugh Bunnell and Ileana Sanchez Espauda (USC)

- **Multi-scale, multi-physics modeling and simulation of single event effects at device and circuit levels**
  Speakers: Jean-Luc Astrain and Daniela Mastrostefano (University of Milano)

2022 Attendees will receive the NSREC 1990-2022 Short Course Compendium Memory Stick presentations with registration.

**SOCIAL EVENTS**

- **Daniel Leavens Local Arrangements Chair**

  Daniel Leavens, University of Tennessee Chattanooga, is the Local Arrangements Chair and is assisted by Mike Weirthing, Brigham Young University. They have arranged an exciting social program in Provo. The Conference Social will be held at Westly Farms on Wednesday evening. Two companion events include tours of Thanksgiving Point and Park City, Utah.

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**NUCLEAR & PLASMA SCIENCES SOCIETY NEWS**

(UIPS 000-550) is published quarterly by the Nuclear & Plasma Sciences Society of the Institute of Electrical and Electronics Engineers, Inc. Corporate Office: 3 Park Avenue, 17th Floor, New York, NY 10016-5997, [https://www.ieee.org/about/contact.html](https://www.ieee.org/about/contact.html). Published in the USA. One dollar per member per year is included in the Society fee for each member of the Nuclear & Plasma Sciences Society.
Technical Committees

NUCLEAR MEDICAL AND IMAGING SCIENCES

Andrew Goertzen
NMISC Chair

With travel restrictions easing in many locations, we look forward to a planned hybrid meeting format for the 2022 NSS/MRTSD meeting in Milano, Italy from 5th-12th November 2022. For many of us this will be the first time in nearly three years that we can gather with international colleagues for in-person meetings and again experience the vibrancy of an in-person or virtual meetings. The current view is that NMISC will have few fewer events for Society activities such as awards, initiatives, AdCom meetings and in-person or so on.

Ralf again mentioned the requirement for conference treasurers to use the budget tool developed by NPSS. If you are, or expect to be a conference treasurer, get in touch with Ralf and learn what the job entails. Reach him at rangel@uc.edu for guidance and the tool.

One of our newest committees, the Education Committee, was approved at the October 2021 AdCom meeting. Subsequently, Steve Meikle asked Stefan Reit to become the inaugural chair. Stefan defined the Committee membership which includes the chairs of the Distinguished Lecturers, Chapters, Transnational, Young Professionals and Publications committees and the N IMS and RTSD elections. They have a new website, https://ieee-npss.org/technical-committees/education-committee/. Check it out to see what might interest you.

Our other new committee is also mentioned in the President’s Report, the NPSS Foundation Fund Advisory Committee, along with a more thorough introduction to EduCom and also to the new Fast Track initiative approval and deployment process. Our technical committees also reported at this meeting, and are doing well. Written reports were received from the functional committees and the liaisons.

AdCom ACTIONS

• It was moved that changes to the PSAC Bylaws be approved. Carried. 23 Y, 0 N, 0 A.

• The Radiation Instrumentation Steering Committee moves that Advancements in Nuclear Instrumentation Measurement Methods and their Applications (ANIMA) 2023 be a Technically Co-sponsored conference of NPSS. Approved. 24 Y, 0 N, 0 A.

• The Radiation Instrumentation Steering Committee moves that the Technically Co-sponsored conference administrative fee for ANIMA 2023 be paid by NPSS. Approved. 23 Y, 0 N, 1 A.

• PSIT moves that AdCom approve that the 2024 International Power Modulator and High Voltage Conference (IPMHC) be a NPSS technically co-sponsored conference. Approved. 23 Y, 0 N, 1 A.

• PSIT moves that AdCom approve that NPSS pay the $1,450 Technical Co-sponsored conference administrative fee for the 2024 International Power Modulator and High Voltage Conference (IPMHC). Approved. 23 Y, 0 N, 1 A.

• AdCom approves transfer of $25k to the NPSS Foundation Fund. Endorsed by FinCom 04-Mar-2022. Approved. 24 Y, 0 N, 0 A.

• NPSS AdCom approves the appointment of June Bell to another 3-year term as the Editor-in-Chief of the IEEE Transactions on Nuclear Science. Approved. 24 Y, 0 N, 0 A.

• The NPSS AdCom approves the appointment ofSteve Field to another 3-year term as the Editor-in-Chief of the IEEE Transactions on Plasma Science. Approved. 24 Y, 0 N, 0 A.

• Changes to the wording of the student award were approved and will go to TABARC.

AdCom will hold its next meeting June 26th-29th in Santa Fe, NM and will be web in person in virtual meeting since March of 2020.

Albo Larson, IEEE NPSS Secretary and Newsletter Editor, can be reached by E-mail at a.m.larson@stanford.edu

From the Bylaws of the Plasma Science and Applications Committee of the IEEE Nuclear and Plasma Sciences Society:

2.1 The Nominations Subcommittee of ExCom has principal responsibility to assemble a balanced slate of qualified ExCom candidates reflecting the diversity of PSAC. Nominations may be made by any member of the Committee by written submission to the Nominations Subcommittee, up until a date fixed each year by the Chairperson of the Committee. Self-nominations are permitted. Eight members of PSAC can also be added to the ballot by a written petition signed by 25 members of the Committee. Such petitions must be submitted to the Chairperson of the Committee no later than June 1 of the year of the election. The Chairperson of the Committee shall ensure that the number of candidates is at least one and one-half (1.5) times the number of positions to be filled.

2.6 ExCom may include up to six non-US member candidates (transnational candidates) who are US residents, one to three US Candidates who are not US residents, and one to two US Candidates who are not US residents, with no distinction between the two categories. The intent is that the Committee to include representation on ExCom from each of the three IEEE Regions outside of North America. Accordingly, in any calendar year for which any of the Regions 8, 9, and 10 have no elected members at-large running over into the following year, the election shall be carried out so as to ensure the election of at least one new member from each of the Regions so affected. In such years, the election ballot shall include at least two designated Regional Candidates from each such Region, and those designated Regional Candidates from Regions 8, 9, or 10 shall be identified to the IEEE Headquarters for purposes of administering the election, but not separately designated on the election ballot.

PPST moves that AdCom approve that the 2024 International Power Modulator and High Voltage Conference (IPMHC) be a Technically Co-sponsored conference. Approved. 23 Y, 0 N, 1 A.

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Technical Committees

Cont. from PAGE 3

counted in a manner determined at the beginning of the election cycle that ensures that at least one of the candidates from each of the affected Regions with at least two members on the ballot is among the six candidates elected to regular three-year terms. If the election is also being used to fill the remainder of an uncompleted 3-year term, the individual receiving the next highest vote shall determine whether each of the six regular three-year terms will be elected to that position. In the event that a tie vote by the general membership of PSAC, the individual selected will be determined by a majority vote of the voting members of the ECem. The tie-breaking votes of the ECem members shall be conducted by fax or electronic mail by the Secretary of the Committee.

JASON MARSHALL, PSAC Chair, can be reached by E-mail at j.aleaxander.marshall@ieee.org; STEVE Gold, PSAC Secretary, can be reached by E-mail at stevegold@comast.net/

RADIATION INSTRUMENTATION STEERING COMMITTEE

Along with the rest of IEEE and other professional societies, Radiation Instrumentation conferences are transitioning back to in-person or hybrid (accommodating both in-person and virtual attendees). The final decision has been for the 2022 Nuclear Science Symposium, Medical Imaging Conference and Room-Temperature Semiconductor Detector (NNS/MIC/RSTD - https://nssmic.ieee.org/2022/) conference to be hybrid with in-person attendance at the Atlanta Convention Centre, Atlanta, Georgia, USA, from November 5th to 12th. The Organizing Committee, led by General Chair Chiara Guazzoni, as well as the entire Radiation Instrumentation Steering Committee (RITC), is looking forward to welcoming all attendees who are able to be in- person in Atlanta and Milan and working diligently to ensure that all those attending virtually will also feel welcomed and find the experience worthwhile with their time and energy. As always, the health and wellness of our attendees is paramount and we will continue to monitor public health guidance and adjust plans and protocols accordingly so continue to check the conference websites early and often to get the latest updates.

We are also pleased to announce that SOFIA 2022 (www.sofia2022.org) 2022, the 16th International Conference on Scintillating Materials and their Applications, will be held September 19th–23rd, 2022 in Santa Fe, NM, USA as an in-person conference.

As brief updates for future NNS/MIC/RSTD conferences, we are planning for 2023 in Vancouver, British Columbia, Canada, 2024 in Boston, Massachusetts, USA, and 2025 in Yokohama, Japan. Note that the latter two NNS/MIC/RSTD conference are at the sites we had previously planned for 2020 and 2021, respectively, but had to convert to virtual due to the COVID-19 pandemic.

Beyond our Radiation Instrumentation conferences, July 15th, 2022 is the deadline for submitting complete nomination packages for the Radiation Instrumentation annual awards.

- The Radiation Instrumentation Early Career Award (RIECA) is given to a young investigator in recognition of significant and innovative technical contributions to the fields of radiation instrumentation and measurement techniques for ionizing radiation. The prize consists of US$5,000 and an engraved plaque. The past recipients of the RIECA can be found on the Radiation Instrumentation Technical Committee (RITC) web page (http://www.ieee.org/technical-committees/radiation-instrumentation/)

- The novel Emilii Katto-Cairns Radiation Instrumentation Outstanding Achievement Award (RIOAA) is given to an individual in recognition of outstanding and enduring contributions to the field of radiation instrumentation. The prize consists of $3,000 and an engraved plaque. The past recipients of the RIOAA can be found on the RITC web page (http://www.ieee.org/technical-committees/radiation-instrumentation/)

Finally, there are a couple of annual opportunities for you and/or your colleagues to become more involved in RISC activities, as well as the larger Nuclear & Plasma Science Society (NPSS) and IEEE.

- Nominations for five people to serve 2023-2025 terms as RISC Members-at-Large are now open. RISC manages the Radiation Instrumentation Technical Committee and its conferences. These three-year terms enable people to become active in IEEE and to guide the future of RITC. Please send all nominations to RISC Secretary Merry Keyser (MerryKeyser@ieee.org) and our Nominations Committee Chair Srilalan Krishnamoorthy (Srilalan@penmedicine.upenn.edu). The nomination deadline is October 1st, 2022.

More information on the Radiation Instrumentation Technical Committee is available at http://ieeeps.org/technical-committees/radiation-instrumentation/

John Valentine, RISC Chair, is with Lawrence Berkeley National Laboratory; Phone: +1(510)486-4920; Mobile: +1(619)377-0016; E-mail: jvalentine@lbl.gov

Charles K. Birdsell Award

John P. Verboncoeur

John P. Verboncoeur received a B.S. (1986) from the University of Florida and a M.S. (1987) and Ph.D. (1992) in nuclear engineering from the University of California at Berkeley (UCB). He currently serves as Senior Associate Dean for Research and Graduate Studies in the College of Engineering at Michigan State University (MSU).

Following appointments as a postdoctoral researcher at UCB and Lawrence Livermore National Laboratory, and as a Research Engineer at UCB, he joined the UCB Nuclear Engineering faculty in 2011, where he founded and chaired the Computational Engineering Science Program 2001-2010. In 2011, he was appointed Professor of Electrical and Computer Engineering at UCB. In 2015, he added an appointment as Professor of Computational Mathematics, Science and Engineering, which he co-founded. His research interests are in theoretical and computational plasma physics and applications. He has authored/coauthored over 400 journal articles and conference papers, with over 5000 citations, and has taught 13 international workshops and mini-courses on plasma simulation. He became an IEEE Fellow in 2013, received the IEEE NPS’s Shea
Glen F. Knoll Postdoctoral Scholar

Thuy Linh Tran

Dr. Linh Tran is currently a research fellow at the Centre for Medical Radiation Physics (CMRP), University of Wollongong (UOW) and is coordinating and leading research in experimental microdosimetry. She received Bachelor's and Master's degrees in Physics at International University of Nature, Society and Man (Duba) – Dubna, Russian Federation in 2009. Following this, she completed her Ph.D. on an advanced semiconductor silicon detector for dosimetry and microdosimetry in radiation protection and hadron therapy at the CMRP, University of Wollongong under the mentorship of Distinguished Professor Anatoly Rosenfeld.

Her research interests include development of semiconductors microdoseimeters, relative biological effectiveness (RBE) in proton and heavy ion therapy, Baron Neutron Capture Therapy (BNCT) and fast neutron therapy (FNT) as well as research on theoretical radiobiological models in hadron therapy and Monte-Carlo simulation for applications in aviation and space. She has published 52 peer-reviewed papers in the field of radiation detectors for space and medicine.

Dr. Tran is a recipient of the American Association of Physicists in Medicine (AAPM) Farrington Daniels Award for best paper in Medical Physics, 2018. She was named a UOM Impact Maker (2019) and a recipient of Dame Bridget Ogilvie Award for Research Excellence (2021). Dr. Tran recently received the prestigious and highly competitive award - the Cancer Development Fellowship- grant from the Cancer Institute, New South Wales, (2022-2025).

Glenn F. Knoll Graduate Scholar Award

Stefano Marin

Stefano Marin is a fifth-year nuclear engineering Ph.D. student at the University of Michigan, Ann Arbor. He is working in Prof. Sara Pozzi’s research group studying the angular momentum of fission fragments and its effects on α-emission correlations. Stefano’s main interest is the implementation of novel analytic techniques for neutron, α, and γ-particle data. Over the course of his Ph.D., Stefano has experienced many back-and-forth interactions with his thesis committee. His recent work has resulted in several journal publications.

Stefano has mentored students at all levels during his Ph.D. career, ranging from undergraduate students to high-school students.

Stefano was born in Torino, Italy, and frequently returns to visit his family and dog. After finishing high school, he moved to Rochester, NY, to study physics. While here, he developed a passion for research and mentoring. He worked in theoretical atomic and molecular physics in his undergraduate days, investigating the effects of externally applied electric and magnetic fields on spin and geometric phases of molecules. He enjoyed immensely his time working on theoretical problems, and he now enjoys dealing with practical problems in the lab.

In his free time, Stefano enjoys reading, cooking, and attempting to repair his broken motorcycle. His favorite fiction and nonfiction books are by H. Hesse and M. E. Riser, respectively.

Edward J. Hoffman Early Career Development Grant

Elena Maria Zannoni

Dr. Elena Mata Zannoni is a postdoctoral research associate at the Nuclear, Plasma and Radiological Engineering Department at the University of Illinois Urbana-Champaign (UIUC), USA, under the supervision of Prof. Ling-Jian Meng. Elena received a B.Sc. degree in Biomedical Engineering (2010) in Biomedical Engineering from University of Pisa, Italy. She earned a Ph.D. in Biomedical Engineering at UIUC in 2021. Her research focuses on the development of advanced SPECT imaging systems based on state-of-the-art semiconductor detectors and collimator designs for which she holds a patent. For her Ph.D. she designed, developed, and characterized a preclinical SPECT system, in collaboration with University of Chicago and Northwestern University. Currently, she is involved in the development of the Dynamic Extremity SPECT (DxSPECT) system for imaging peripheral vascular disease in lower extremities, in collaboration with University of Pennsylvania and Yale University, and in a U01 grant for the development of the AlphaSPECT system, a full-body hyperspectral SPECT system for targeted alpha therapy applications, in collaboration with Johns Hopkins University. The NPPS Edward J. Hoffman Early Career Development Grant will support these developments and short-term visits to the collaborating clinical institutions.

Elena has presented her research at various IEEE NSS/MIC symposiums and in other international conference proceedings and co-authored 40+ presentations and workshops. She received young investigator awards for best oral presentations at IEEE NSS/MIC and SWARM Annual Meetings, and several grants from the IEEE Women in Engineering Society and the NPPS, including, twice the Valentina T. Jardim Radiation Instrumentation Award.

Magn “Kris” Kristiansen Award

Brad Hoff

Brad W. Hoff (S’04-M’10-SM’18) is a Senior Scientist at the Air Force Research Laboratory (AFRL). His research background includes high power RF source technology, pulsed power systems and diagnostics, PIC modeling, and electromagnetic interactions with high temperature materials. Current research interests involve high power microwave sources, nonlinear transmission lines (NLLs), microwave-driven plasmas, applications of additive manufacturing techniques to HPM sources, directed energy interactions with high-temperature materials, and power beaming. Dr. Hoff holds degrees from the U. S. Naval Academy (B. S. in Physics) as well as the University of Michigan (M.S. in Nuclear Engineering, M.S.E. in Electrical Engineering and Ph.D. in Nuclear Engineering). Dr. Hoff is a Fellow of the Air Force Research Laboratory, an IEEE Senior Member, and a Member of the IEEE Nuclear and Plasma Sciences Society (NPSS).

Robert J. Barker Graduate Student Award

Daniel Mader

My name is Daniel Mader, born in Israel - 1991. I have received my Bachelor’s degree in physics from the Faculty of Physics at the Technion – Israel Institute of Technology in 2018 and I joined the plasma and pulsed power research group under the supervision of Prof. Yakov Kozik. In 2020 I have transferred to a direct track toward a Ph.D. in physics. During my Master’s studies, I constructed, tested and used a Photonic Doppler Velocimetry system for the determination of the velocity of a metal target accelerated by the shockwave and waterflow generated by an underwater electrical wire gun. This method of target acceleration, commonly used for shock compression, was demonstrated both in microsecond and sub-microsecond generators as being rather efficient and scalable. Moreover, using two-dimensional hydrodynamic numerical simulation, surprising observed phenomena, such as second acceleration without energy input, were explained.

Another part of my research is utilizing the advantages of underwater electrical electrodes and resulting strong shocks for the generation of supersonic water jet using the explosion of cylindrically and conically symmetric arcs. The observed water jets in experiments reached close to 4-km/s with only few kW of energy stored in the different time-scale generators. Two-dimensional FLASH simulations helped explain the mechanism behind the formation of these extreme jets. As for the future, I hope to take an active part in the research and to further advance the science and technology behind sustainable nuclear fusion.

Continued ON PAGE 6

THE 1% SOLUTION

I have learned that 99% of progress is failure.

Michael J. Fox

WITH DIFFERENT ATTITUDES

Work and play are used to describe the same thing under different conditions.

Mark Twain
Functional Committees

Conner W. J. Bevington
Conner Bevington is a Ph.D. candidate in the Department of Physics and Astronomy at the University of British Columbia (UBC). He holds a B.Sc. (Physics, 2017) from the University of Waterloo and a M.Sc. (Physics, 2019) from UBC. He conducts medical physics research in the UBC PET/MR Imaging Centre under the supervision of Prof. Vineta Soso, developing image processing, modeling, and analysis algorithms for Positron Emission Tomography (PET) and MRI, aimed at mitigating noise in the raw data. The main focus of his research is to improve quantitative interplay and image processing of PET/MR images. His current projects include investigating related research of dopamine release using PET, as well as quantifying brain energetics through the usage and production of energy in the brain by applying intricate denoising and pattern analysis to PET/MR images. These methods are being applied to two clinical studies: the first investigates the potential loss of segregation in brain function in early Parkinson’s Disease (PD) and the second investigates the modulating effect of exercise on brain energetics in PD. In addition to the NPSS Graduate Scholarship Award, Conner also holds a NSERC Postgraduate Scholarship, a B.C. Graduate Scholarship, and several medical imaging conferences awards. During his undergraduate studies Conner performed research in cosmology. Upon entering graduate school, he noticed methodological similarities between image processing in cosmology and medical physics. Always having a casual interest in neuroscience, a transition to medical imaging provided the ideal merger between his interests and academic background. Outside of research, he enjoys reading, cooking, travel, music production, and flying small aircraft.

Jingchen Cao
Jingchen Cao was born in Changchun, China. He received B.S.c (Physics, 2017) from the University of Michigan. He is a Ph.D. student in the Department of Electrical and Computer Engineering, Communications Engineering from Zhengjiang University, Hangzhou, China. His research interests include: 1) develop and verify a surface-potential-based compact model of 2D material field effect transistors, 2) evaluate single-event response of RF designs in advanced bulk FinFET technologies for exposures including alpha particles, fast-neutron heavy ions and so on, and 3) research on total ionizing dose effects and reliability mechanisms for advanced nanoscale memory devices. Jingchen has over 20 publications in the field of electrical engineering, about 10 of those are on radiation effects in microelectronic devices and materials. These papers have been cited ~250 times (citation h factor = 7, Google Scholar).

Enxia Zhang
Enxia Zhang has been a professor at the College of Life Science at the University of Michigan since 2020. She received her Ph.D. degree from the Shanghai Institute of Microsystem and Information Technology (SIMIT), Chinese Academy of Sciences, in 2006. Enxia worked at SWIT as a Research Assistant Professor after graduation (2006-2007) and then joined the Shanghai University of Engineering Science as an Associate Professor (2007-2009). In 2009, she joined the Radiation Effects and Reliability Group in the Department of Electrical Engineering and Computer Science at Vanderbilt University in Nashville, Tennessee, as a post-doctoral research assistant. She was promoted to Research Associate Professor of Electrical Engineering in 2010 and to Research Associate Professor of Electrical Engineering and of Material Science in 2017. Enxia’s research interests include: 1) research on radiation response and reliability mechanisms for microelectronic devices; a built-in semiconductor devices and emerging materials; 2) radiation-induced single-event effects and charge collection in advanced devices; and 3) simulation and measurements for space and medical applications. Her current research includes: 1) simulation and analysis of microelectronic devices and materials, seven of which have been recognized with outstanding conference and/or student paper awards. These papers have been cited ~4000 times (citation h factor = 33, Google Scholar). Enxia is a Senior Member of the Institute for Electrical and Electronics Engineers. She has served as a session chair for the IEEE Nuclear and Space Radiation Effects Conference, NSREC in 2013, and will serve in 2022, at the NSREC Awards Committee (2018-2020), on the program committee for several meetings of the American Vacuum Society (2013-2014), and on the radiation effects safety committee for Vanderbilt University since 2017. Enxia has also volunteered as a Chinese language and Bible school teacher in the local community.

Yang Zhou
Yang Zhou is currently a Ph.D. student in the Department of Electrical and Computer Engineering, Michigan State University under the supervision of Prof. Peng Zhang. His research interests are in theory and modeling of electron emission physics, including field emission, photoemission and thermionic emission. In the past five years, he has been focusing on the study of electron emission with the effects of laser properties, e.g., wavelength, intensity, the corresponding laser-induced heating, as well as the effects of cathode surface states, e.g., coatings, contaminants, and near-ions. His studies provide insights into both the fundamental physics and the design of cathodes of higher stability and efficiency. He is also interested in electrical contacts, which is a limiting factor for devices made of dissimilar materials, e.g., carbon nanotubes (CNTs) field emitters on a metallic substrate. In his spare time, he likes hiking, badminton and photography.

Women in Engineering Leadership Development Travel Grant

Emia Zhang
Emia Zhang received her B.S. and M. S. degrees in Material Science from Nanjing University of Science and Technology in 2000 and 2003. She received her Ph. D. degree in Microelectronics and Solid-State Electronics from Shanghai Institute of Microsystem and Information Technology (SMIT), Chinese Academy of Sciences, in 2006. Emia worked at SWIT as a Research Assistant Professor after graduation (2006-2007) and then joined the Shanghai University of Engineering Science as an Associate Professor (2007-2009). In 2009, she joined the Radiation Effects and Reliability Group in the Department of Electrical Engineering and Computer Science at Vanderbilt University in Nashville, Tennessee, as a post-doctoral research assistant. She was promoted to Research Associate Professor of Electrical Engineering in 2010 and to Research Associate Professor of Electrical Engineering and of Material Science in 2017. Emia’s research interests include: 1) research on radiation response and reliability mechanisms for microelectronic devices; built-in semiconductor devices and emerging materials; 2) radiation-induced single-event effects and charge collection in advanced devices; and 3) radiation response and measurements for space and medical applications. Her current research includes: 1) simulation and analysis of microelectronic devices and materials, seven of which have been recognized with outstanding conference and/or student paper awards. These papers have been cited ~4000 times (citation h factor = 33, Google Scholar). Emia is a Senior Member of the Institute for Electrical and Electronics Engineers. She has served as a session chair for the IEEE Nuclear and Space Radiation Effects Conference, NSREC in 2013, and will serve in 2022, at the NSREC Awards Committee (2018-2020), on the program committee for several meetings of the American Vacuum Society (2013-2014), and on the radiation effects safety committee for Vanderbilt University since 2017. Emia has also volunteered as a Chinese language and Bible school teacher in the local community.

FINANCE

Operational Committee for the NPSS Fund Established

Roger Fulton
NPSS Fund Chair

NPSS President Steven Melkie has appointed Roger Fulton to lead the operational committee for the new NPSS Fund. Existing volunteers who have been working on the fund’s initial definition and approval will be joined by new appointments in the coming weeks. Funded Imperatives will be restricted to those that support NPSS mission-driven educational, outreach, diversity and humanitarian efforts. While initiatives funded under the IEEE rules are limited to three years maximum, the imperatives funded with the NPSS Fund will not have that time limit and can also support the expansion of existing activities, those that are not allowed by IEEE initiative funding.

The IEEE Foundation is currently establishing their internal systems and documentation to include the NPSS Fund and one that is done and our operational committees is fully established and running, the new NPSS Fund will be in operation.

We are excited to be able to expand our activities within our fields of interest, including expanding the existing support for students.

Roger Fulton, NPSS Fund Chair, can be reached by E-mail at roger.fulton@vanderbilt.edu, Peter Clout, Communications Chair, can be reached by E-mail at p.clout@ieee.org.

NOMINATIONS

Ron Schrimpf
Nominations Chair

Four NPSS AdCom positions open for nomination.
The NPSS Administrative Committee (AdCom) consists of various members including elected members from our eight Technical Committees (TC) and the Transnational Committee. Four TCs have open positions starting in 2023 for a term of four years.

- Nuclear Medical and Imaging Sciences (NMISC)
- Particle Accelerator Science and Technology (PAST)
- Radiation Effects (REC)
- Radiation Instrumentation (RITC)

If you are interested in one of these positions or want to nominate someone, please contact our Nominations Chair, Ron Schrimpf, at ron.schrimpf@vanderbilt.edu. Candidates must be members in good standing of the NPSS and the IEEE. Each nomination must contain a statement of the willingness and ability of the nominee to serve if elected, the membership status and number of the nominee, a short biography, and a statement of topics that the candidate wishes to address as an AdCom member. Nominations must be sent to the Nominations Chair before June 1, 2022.
Solar Powered, Point-of-Use Plasma Disinfection Tool for Clean Water on Demand

The leading cause of death worldwide is water-borne disease. Some 3.4 million people die each year from drinking unclean water. The primary source of contamination is raw sewage intrusion into drinking-water sources due to the lack of wastewater-treatment infrastructure. According to the World Health Organization, 10,000 women and 400,000 babies die every year associated with infections during childbirth due to poor hand cleaning—deltas that could have been prevented if clean water and hand sanitizers were readily available. These staggering numbers are horrifying. With plasma technology, we aim to develop and field a simple tool for point-of-use water treatment for on-demand clean water for drinking and basic sanitation.

Funded as an IEEE NPSS Humanitarian Initiative, we are working to develop and demonstrate a solar (or human)-powered, plasma-based point-of-use accessory for disinfecting on-demand moderate amounts of water for hand washing and drinking. The target sterilizing water will provide limited residual disinfecting power for destroying pathogens on surfaces coming in contact with the water as well. The goal is to distribute these devices to developing countries.

The basis of the technology being explored for this application is a spin-off device, the plasma wand, developed at the University of Michigan for the purpose of disinfecting surfaces in response to the COVID pandemic. The technology was designed to facilitate the control of gas-phase chemistry, allowing for the enhancement of the production of oxidants such as ozone and hydrogen peroxide and the reduction below US EPA maximum concentration level of undesirable byproducts such as nitrates and nitrates. The half-life of the dose of peroxide, and to a much lesser degree ozone, are expected to provide enough limited residual disinfecting power to enable immediate use. Disinfecting power will be quantified as a function of time and initial water quality. To achieve these goals, we have characterized the ability of the source to deliver dose to water targets. We recently treated water targets contaminated with E. coli to demonstrate efficacy. E. coli is commonly used as a pathogen indicator in water-pollution control. E. coli is also a contributor to water-borne disease. Figure 1 depicts the graduate students working on the project and the disinfection capacity of the device. The plasma wand has demonstrated the capacity to destroy MS2, a model virus, as well. The next step is the application of EPA certification challenges testing for infectious microbes using noninfectious models to the device; optimizing performance and ultimately proving a pathway to broad certification. A key consideration in this effort is the power supply. Power supplies used to make nonthermal plasmas for applications such as this are expensive and would otherwise make this technology not broadly accessible, particularly in economically disadvantaged, resource-limited underdeveloped countries. That said, a key focus of this effort is to demonstrate operation using cheaper, essentially off-the-shelf power supplies that achieve desired voltage requirements albeit over a limited range. Here we seek to integrate an inexpensive on/off black box power supply—no tuning in the field—should be necessary. Under a previous activity we demonstrated that we could power a plasma power supply with a human-powered, bicycle-coupled generator. This approach along with a solar-powered embodiment will be explored. We would like this technology to be robust and usable day or night.

IEEE NPSS initiatives are focused on translational processes to produce society benefiting technologies from fundamental research. This project leverages fundamental plasma research to a deployable, developing-world platform to sanitize water for drinking and hand cleansing. Successful deployment of the clean-water station will directly address public health needs in developing countries where often adequate wastewater treatment is lacking, and the logistical pipeline for conventional disinfectants fails. Following laboratory demonstration, we will approach foundations (e.g., Ford, Gates) to sponsor a pilot deployment program (e.g., 5-10 units). Our intent is that this be a nonprofit venture, and so will affiliate with existing NGOs. In fact, we have already garnered support from a nonprofit to assist in the power-supply development.

Professor John Foster can be reached at the University of Michigan Department of Nuclear Engineering and Radiological Sciences, Plasma, Science and Technology Laboratory, Ann Arbor, MI; Phone: +1 734-764-1976; or by Email at jefoster@umich.edu.

Figure 1. Upper-Graudate students Rozanne Pimsky and Chelsea Tischler. Lower-Experimental results demonstrating disinfection power of plasma wand tool.

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75th Anniversary of the Transistor – a Boilermaker Reflects

2022 is the 75th anniversary of the invention of the transistor by Bardeen, Brattain, and Shockley. Their original transistor is shown schematically in [1]. Thanks to more than six decades of Moore’s Law scaling of integrated circuits (ICs) [2], as illustrated in Fig. 2 [3], [4], advanced chips such as the Apple M1 Ultra now feature more than 100 billion transistors [5]. Moore’s Law scaling has profoundly affected the radiation response of transistors and ICs [6], a topic explored in detail in the NPSS Distinguished Lectures Program [6].

I received my Ph.D. in Physics from Purdue University in 1984. At Purdue, the transistor is known as “the one that got away,” for reasons I will now discuss briefly. During the Second World War, Purdue developed high-quality, miniaturized germanium (Ge) rectifiers to serve as microwave detectors in support of the MIT Radiation Laboratory’s radar project. The work at Purdue helped to establish Ge as a useful and valuable semiconductor device. Following laboratory demonstration, we will approach foundations (e.g., Ford, Gates) to sponsor a pilot deployment program (e.g., 5-10 units). Our intent is that this be a nonprofit venture, and so will affiliate with existing NGOs. In fact, we have already garnered support from a nonprofit to assist in the power-supply development.

Dan Fleetwood
Vanderbilt University

Fig. 1. Schematic diagram of a point contact transistor, implemented in germanium (Ge). (After [1]. © American Institute of Physics, AIP, 1948.)

Fig. 2. transistor count and IC performance, frequency, power, and number of logical cores from 1911 through 2020. The geometrically increasing trend in transistor count reflects Moore’s Law scaling. (After [5], [6].)

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Karl Lark-Horovitz served as Physics Department Head at Purdue from 1932 until he died in his office in 1958 [7], which happened to be the year that I was born. The Lark-Horovitz Award for graduate research at Purdue is named in his honor; I was fortunate to be a co-recipient in 1984.

Professor Ralph Bray was my instructor in graduate solid-state physics in Fall 1980. He was enthusiastic in teaching us all about Ga semiconductor physics, and never bitter about missing his early, fundamental contributions to semiconductor physics. So I only learned about his and Purdue’s historic contributions to semiconductor physics, the transistor, and radiation effects much later in my career when working in similar research areas first at Sandia National Laboratories (1984-1999) and now at Vanderbilt University. Coincidence or Boilermaker legacy? Perhaps a bit of each.

REFERENCES:

Dan Fleetwood serves as NPSS Distinguished Lecturers Chair and IEEE Educational Activities Board liaison, and as Senior Editor, Radiation Effects, for the IEEE Transactions on Nuclear Science. He can be reached via email at dan.fleetwood@vanderbilt.edu.

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