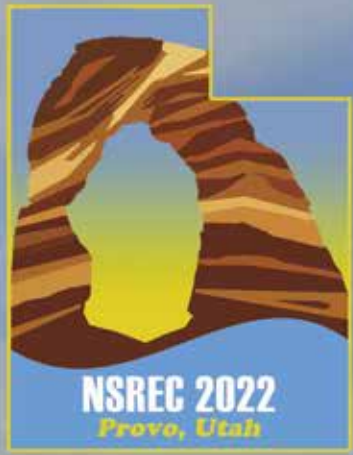


NPSS NEWS

ISSUE 2: JUNE 2022

A PUBLICATION OF THE
INSTITUTE OF ELECTRICAL &
ELECTRONICS ENGINEERS



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

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Tom Turflinger
2022 NSREC General Chair

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, IR HiRel Products, An Infineon Technologies Company, Jet Propulsion Laboratory, L3Harris, 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,



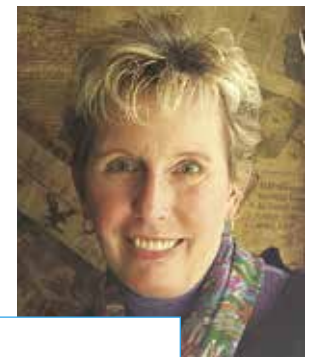
Pascale Gouker
Technical Program Chair

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



Teresa Farris
RE Vice Chair, Publicity,

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

CONFERENCES Continued on PAGE 2

NSREC. *Cont. from PAGE 1*

» Utah Rocks!

Ron Harris, 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. Etienne. 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 Santin (ESA)

» 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 Barnaby and Ivan Sanchez Esqueda (ASU)

» Multi-scale, multi-physics modeling and simulation of single event effects at device and circuit levels

Speakers: Jean-Luc Aufran and Daniela Munteanu (University of Marseille)

2022 Attendees will receive the NSREC 1980-2022 Short Course Compendium Memory Stick presentations with registration.

SOCIAL EVENTS



Daniel Loveless
Local Arrangements Chair

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

INDUSTRIAL EXHIBIT



Tara Luther
Industrial Exhibit Chair

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.nsrec.com or contact Tara at Tara.Luther@SkyWaterTechnology.com.

PROVO, UTAH

Provo is situated in the heart of Utah Valley between the eastern shore of Utah Lake and the towering Wasatch Mountains. Mount Timpanogos dominates the northern part of the city at 11,957 feet (3,644 meters); these rugged mountains east of Provo create one of the most picturesque backdrops in Utah.

Provo is a small city with a bustling downtown area with its variety of shops and activities and is home to Brigham Young University. It is a city steeped in history, with world-class museums, galleries, performing arts, and family attractions. And Provo is the ideal starting point to visit the great American Southwest! With the Wasatch to the north, the High Uintas Wilderness to the east and Utah's five magnificent National Parks in the south (and the Grand Canyon just beyond), Provo provides endless opportunities for world-class outdoor activities. Prepare to be amazed!

The Utah Valley Convention Center is ideally located in the city center and adjacent to the Provo Marriott and Hyatt Place, offering excellent accommodations. Within minutes, you will be within 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.nsrec.com>. Alternatively, you may contact the General Chair, Tom Turflinger, E-mail thomas.turflinger@aero.org. You may contact the Publicity Chair, Teresa Farris, E-mail: teresa.farris@archon-llc.com.

President's Report



Steve Meikle
IEEE NPSS President

I would like to use this newsletter column to update you on some of the recent initiatives of AdCom on behalf of NPSS and stimulate you to think about opportunities to promote educational and outreach activities within your technical field.

Since the last newsletter, Roger Fulton has kindly agreed to Chair the newly formed NPSS Foundation Fund Advisory Committee while Peter Clout has taken on the role of Communications and Donations Chair. Thank you both for taking on these important roles. The Advisory Committee reports to FinCom and, under Roger's leadership, it will help steer the direction of the new Fund which was established to support the Society's education, outreach, diversity and humanitarian efforts. The NPSS Foundation Fund gives the Society greater flexibility in the way

we finance ongoing mission-critical imperatives that grow out of successful new initiatives which we wish to continue without placing added pressure on our operating budget. We have seeded the Fund with an initial \$25,000 donation from NPSS and under Peter's leadership we will develop strategies to attract financial support from other donors.

Meanwhile, we continue to consider new initiatives and projects that support the Society's strategic goals through the 3%/1% rule. This is an IEEE rule that allows us to use up to 3% of their share of reserves to fund new initiatives in the following year, provided the total initiative budget across all Societies and Councils doesn't exceed 1% of IEEE reserves. We have used this mechanism to fund a number of very successful initiatives over the past 10 years, including the Instrumentation Schools that have helped train nuclear instrumentation students in Asia and South Africa, and various humanitarian projects sponsored by IEEE Smart Village that have seeded self-sustaining entrepreneurial enterprises broadly related to our technical fields of interest in developing countries, such as India, Nepal and Guatemala.

More recently, John Verboncoeur and Hal Flescher have introduced a Fast Track process that enables "shovel ready" projects to access funding as soon as their projects are approved rather than waiting for the funding cycle to commence in the following

year. At our most recent meeting in March, AdCom approved a priority slate of Fast Track projects. For example, Open Kinetic Modeling is an initiative led by Guobao Wang (UC Davis) and Youngho Seo (Stanford) to run a series of workshops on tracer kinetic modeling and to develop open-source software (OpenKMAP), with the aim of encouraging a new generation of scientists to specialise in this critical area of nuclear medical imaging. Another project, NuVirLab, proposed by Martin Grossmann (PSI) in collaboration with colleagues from the University of Science, Ho Chi Minh City, will provide a virtual nuclear physics and medical physics lab with theoretical calculation tools and interactive experiments to make such tools more accessible to inexperienced users (students) and professional communities in related fields (e.g., clinical medical physicists, educators).

These are just a couple examples of strategic short-term projects our Society has recently supported to advance educational and other outreach activities in our fields of interest, beyond the recurring activities we are able to fund out of our normal operating budget. If these initiatives are successful, we now have more mechanisms available, such as the NPSS Foundation Fund, to help them become ongoing sustainable activities of the Society.

I am pleased to report that EduCom, our newest functional committee, is up and running under the leadership of Stefan Ritt. They have set up a

new web page at <https://ieee-npss.org/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. EduCom is already planning several new educational activities over the next 18 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/>) 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 Meikle, IEEE NPSS President,
can be reached by E-mail at
steven.meikle@sydney.edu.au.

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 Meikle 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's must have agreed, The impact on IEEE 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 this pilot program to date. President Steve Meikle also sent a message to the president of the East Ukraine Section Chapter indicating our support for Ukraine in these difficult times.



Albe Larsen
IEEE NPSS Secretary and Newsletter Editor

NUCLEAR & PLASMA SCIENCES SOCIETY NEWS

(USPS 000-560) is published quarterly by the Nuclear & Plasma Sciences Society of the Institute of Electrical and Electronics Engineers, Inc. Corporate Office: 3 Park Avenue, 17th Floor, New York, NY 10016-5997, <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.

Our guest, Manfred (Fred) Schindler, Division IV Director, discussed several other items from the TAB meeting including a proposed change to the IEEE Constitution Article XIV which deals with votes needed to pass the amendment. The biggest change would be in requiring enough votes from each region. Another change is to allow electronic signatures for petitions for amendments. The Board will discuss and decide on adding this amendment to the ballot in June. For further information search Article XIV on Collabratec. Other items discussed by Fred included proposed changes to the Fellows process, Realignment of IEEE Regions, a presidential election pilot designed to deal with electioneering issues, and IEEE finances.

Our Treasurer, Ralf Engels, reported on the health of our conferences and our treasury. Our conferences are closing in a timely way. Although our conferences are in the black financially, the dollar return is quite low due to the reduced fees for virtual meetings. In 2022 we'll see how hybrid meetings, which are more expensive to produce than solely either in-person or virtual meetings, perform. The current view is that NPSS will have fewer funds for Society activities such as awards, initiatives, AdCom meetings in person and 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 r.engels@fz-juelich.de for guidance and the rules!

One of our newest committees, the Education Committee, was approved at the October 2021 AdCom meeting. Subsequently, Steve Meikle asked Stefan Ritt 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 WIE and EAB liaisons. They have a new web site, <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 (ANIMMA) 2023 be a Technically Co-Sponsored conference of NPSS. Approved. 24 Y, 0 N, 0A

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

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

» PPST 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 (IPMHVC). 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, 0A.

» AdCom approves Fast Track Initiative slate prioritization, and funding F8, F7, F2, and F5. Endorsed by FinCom 04-Mar-2022. Approved. 23 Y, 0 N, 1 A.

» The NPSS AdCom approves the appointment of Zane 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 of Steve Gitomer 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 28th–30th in Santa Fe, NM and will be our first in-person meeting since March of 2020.

Albe Larsen, IEEE NPSS Secretary and Newsletter Editor, can be reached by E-mail at a.m.larsen@slac.stanford.edu

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/MIC/RTSD 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 face-to-face meetings and again experience the vibrancy of an NSS/MIC/RTSD poster session.

IEEE NPSS Edward J. Hoffman Early Career Development Grant

It is with great pleasure that we congratulate Elena Maria Zannoni from the University of Illinois Urbana-Champaign on receiving this award. This is the second year this award has been offered and is made possible by a generous donation to the IEEE Foundation from Carolyn Hoffman. Elena intends to use the award funds to support short visits to clinical sites collaborating on the development of dynamic and hyperspectral SPECT systems. See the Awards section under Functional Committees.

Upcoming Deadlines for NMISC Awards

The deadline for nominations for the 2022 NMISC Awards is July 15th, 2022. These awards are the Edward J. Hoffman Medical Imaging Scientist Award, given annually to an individual in recognition of outstanding contribution to the field of medical imaging science; the Medical Imaging Technical Achievement Award, given annually to a mid-career individual who has made significant and innovative technical contributions to the field of medical imaging science; and the Bruce Hasegawa Young Investigator Medical Imaging Science Award, given

annually to a young individual in recognition of significant and innovative technical contributions to the field of medical imaging science. Please consider nominating a colleague or encouraging others to nominate a deserving candidate. Further information can be found at: <https://ieee-npss.org/technical-committees/nuclear-medical-and-imaging-sciences/>

CALL FOR COMMITTEE NOMINATIONS

Nominations for the 2023-2025 Nuclear Medical and Imaging Sciences Council (NMISC) Member-at-Large terms are now open. NMISC manages the Nuclear Medical and Imaging Sciences Technical Committee and its conferences. These three-year terms allow members to become active in Technical Committee and IEEE activities and guide the future of NMISC. Please send nominations to NMISC Secretary Nicolas Karakatsanis (nak2032@med.cornell.edu). The nomination deadline is June 1st, 2022.

Nominations are also open for electing an AdCom representative to a four-year term from 2023-2026. AdCom facilitates all of the activities of the society. The nomination deadline is also June 1, 2022 so please reach out to myself or Nicolas if you are interested in putting a nomination forward.

More information on NMISC activities is available at <https://ieee-npss.org/technical-committees/nuclear-medical-and-imaging-sciences/>

Andrew Goertzen, NMISC Chair, can be reached by e-mail at Andrew.Goertzen@umanitoba.ca.

PLASMA SCIENCE AND APPLICATIONS



Jason Marshall
PSAC Chair

Steve Gold
PSAC Secretary



On 12th November 2021, the PSAC Executive Committee (ExCom) held an E-mail vote to approve two amendments to our Bylaws governing the election of transnational members to the ExCom, where transnational refers to members whose primary residence is outside of the US and Canada. The Split for clarity and readability amendments were approved by the required 2/3 majority of the full ExCom. Subsequently, per a motion submitted by PSAC Chair Jason Marshall, the NPSS AdCom approved these changes to the PSAC Bylaws at its Zoom meeting on 5th March 2022. These changes became effective as soon as the NPSS AdCom approved them, and therefore will apply to this year's ExCom election. However, the PSAC Constitution also requires that any changes to the Bylaws be published in the NPSS Newsletter. This article summarizes the motivation and content of the revisions to PSAC Bylaws 2.1 and 2.6 governing the election of transnational members to the PSAC ExCom.

The ExCom has 18 elected voting members-at-large who serve three-year terms, with elections held annually to replace the six members whose terms are expiring at the end of each calendar year. The purpose of the revisions is to guarantee that the ExCom will always have representation from IEEE Regions 8, 9, and 10, which together comprise the entire world outside of the US and Canada, and that we will set aside seats in our annual election when necessary (but only when necessary) to ensure that representation. Below is the revised version of Bylaws 2.1 and 2.6, ~~with the deleted text struck out and shown in red~~ and ~~the newly inserted text shown in blue~~. The complete Constitution and Bylaws dated 12th November 2021 can be found on the PSAC webpage: <https://ieee-npss.org/technical-committees/plasma-science-and-applications/>.

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. Eligible 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. ~~Each election ballot shall include at least two transnational candidates, where transnational refers to candidates whose primary residence is outside of the US and Canada. Those transnational candidates shall be identified to the IEEE Headquarters, but not separately designated on the election ballot. It is the intent of 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 carrying 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. However, if a sufficient number of candidates from a Region cannot be found, this provision may be passed over.~~

2.6 Forty-five days after distribution of the ballots, the IEEE Headquarters shall count and tabulate the votes. In general, those nominees receiving the highest number of votes will be elected. ~~However, the ballots shall be counted in a manner determined at the beginning of the election cycle that ensures that at least one of the transnational candidates is among the six candidates elected to regular 3-year terms. However, in years in which Bylaw 2.1 mandates the designation of Ballot candidates from Regions 8, 9, or 10, the ballots shall be~~

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 3-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 total after determination of the six regular three-year terms will be elected to that position. In the event of 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 ExCom. The tie-breaking vote of the ExCom 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.alexander.marshall@ieee.org; Steve Gold, PSAC Secretary, can be reached by E-mail at steeveg@comcast.net

RADIATION INSTRUMENTATION STEERING COMMITTEE



John Valentine
RISC Chair

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 (NSS/MIC/RTSD - <https://nssmic.ieee.org/2022/>) conference to be hybrid with in-person attendance at the Milan Convention Centre, Milano, Italy, from November 5th to 12th. The Organizing Committee, led by General Chair Chiara Guazzoni, as well as the entire Radiation Instrumentation Steering Committee (RISC), is looking forward to welcoming all attendees who are able to be there in-person to Milan and working diligently to ensure that all those attending virtually will also feel welcomed and find the experience to be worth their time and effort. 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 web sites early and often to get the latest updates.

We are also pleased to announce that SCINT 2022 (www.lanl.gov/scint2022), 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 NSS/MIC/RTSD 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 NSS/MIC/RTSD 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\$1,500 and an engraved plaque. The past recipients of the RIECA can be found on the Radiation Instrumentation Technical Committee (RITC) web page (<http://ieee-npss.org/technical-committees/radiation-instrumentation/>).

- » The novel Emilio Gatti Radiation Instrumentation Technical Achievement Award (RITAA) recognizes a mid-career individual who has made significant and innovative technical contributions in the field of radiation detectors, radiation instrumentation, and/or nuclear electronics, and/or measurement techniques for ionizing radiation. The prize consists of US\$2,000 and an engraved plaque.

- » The prestigious Glenn F. Knoll 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://ieee-npss.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 June 1st, 2022.

- » Nominations for a single 2023-2026 term as a RITC representative on the NPSS Administrative Committee (AdCom) are now open. The fields of interest of the NPSS include Nuclear Science and Engineering (including radiation detection and monitoring instrumentation, radiation effects, nuclear biomedical applications, particle accelerators, and instrumentation for nuclear power generation), and Plasma Science and Engineering (including plasma dynamics, thermonuclear fusion, plasma sources, relativistic electron beams, laser plasma interactions, diagnostics, and solid state plasmas). The NPSS sponsors more than seven conferences and four peer reviewed journals. Please send all nominations to the NPSS Nominations Chair Ron Schrimpf (ron.schrimpf@vanderbilt.edu). The nomination deadline is June 1st, 2022.

- » Nominations for a single 2023-2024 term on the Joint Oversight Subcommittee (JOS) of RISC and Nuclear Medical Imaging Sciences Council (NMISC) are now open. JOS is responsible for the NSS/MIC/RTSD conference site selection process. RISC and NMISC are seeking to identify and nurture a small group of people interested in identifying outstanding venues for this conference. 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 <https://ieee-npss.org/technical-committees/radiation-instrumentation/>

John Valentine, RISC Chair, is with Lawrence Berkeley National Laboratory; Phone: +1(510)486-4920; Mobile +1(619)371-0016; E-mail: jvalentine@lbl.gov

Functional Committees

AWARDS



Stefan Ritt
Awards Chair

Richard F. Shea Distinguished Member Award

Janet L. Barth



Janet Barth
2022 Richard F. Shea Award Recipient

Janet L. Barth retired from NASA's Goddard Space Flight Center (GSFC) in 2014. At her retirement, she served as the Chief of the Electrical Engineering Division (EED) where she was responsible for the delivery of spacecraft and instrument avionics to

several of NASA's science missions, including the Solar Dynamics Observatory, the SWIFT Burst Alert Telescope, the Lunar Reconnaissance Orbiter, the Global Precipitation Measurement mission, the Magnetospheric Multiscale Mission, and the James Webb Space Telescope (JWST). She also oversaw development of microwave and optical communications systems and suborbital avionics systems at the Wallops Flight Facility. Early in her career, she worked as a radiation hardness assurance engineer and developed radiation environment requirements for over 35 missions, including the Hubble Space Telescope, JWST, the Earth Observing Missions, and the NOAA Geostationary Environment Satellites. She was a member of the team that developed NASA's systems engineering approach to radiation hardness assurance for emerging technologies.

Starting in 1999, Janet worked on the development of NASA's Living With a Star (LWS) Program as a member of the science pre-formulation/proposal team and the LWS Program Science Architecture Team. In 2001 she was selected as the Project Manager for the LWS's Space Environment Testbed. In 2005 she proposed, organized, and chaired the 2005 LWS Program's International Space Radiation Model Development Workshop, the outcome of which established and documented the requirements for new models of the Van Allen belts. In March 2015 the long awaited new Van Allen belt models (International Radiation Environment Near Earth /AE9 and AP9) were released to the international community.

From 2002 to 2008, Janet was a branch manager in GSFC's EED. She was appointed to the GSFC Center Director's Advisory Council, serving on the

committee from 2006 to 2014, and she chaired NASA's Avionics Steering Committee in 2013. She received the NASA Exceptional Achievement Medal in 1999 and the Robert H. Goddard Award of Merit in 2014.

In addition to her technical achievements, Janet was a member of the NPSS Administrative Committee from 2008 to 2022. She was the President of the NPSS from 2013 to 2014. Other roles include the Awards Committee Chair, the Liaison for Women in Engineering, and an elected member for Radiation Effects. She was the Executive Chair of the NPSS Radiation Effects Technical Committee from 2018 to 2021 and is currently the Past-chair of the Technical Committee. In 2014 she was presented with the Radiation Effects Award. She is actively involved with the IEEE Nuclear and Radiation Effects Conference (NSREC), teaching the Short Course in 1997, serving as the Guest Editor of the *Transactions on Nuclear Science* from 1998 to 2000, the Technical Program Chair in 2001, and the General Conference Chair in 2006. She is a regular participant in the European Radiation and its Effects on Components and Systems (RADECS) Conference.

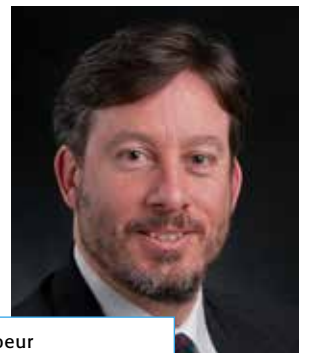
Currently, Janet is a Subject Matter Expert for Cornell Technical Services, Norfolk, VA and is a member of the Board of Advisors for MERC Aerospace, Inc., Passadena, MD.

Janet is a Life Fellow of the IEEE.

Citation: For outstanding leadership in all realms of NPSS activity – technical contributor, conference chair, technical committee member, technical committee chair, AdCom member, president.

Charles K. Birdsall Award

John P. Verboncoeur



John Verboncoeur
2022 Birdsall Award Recipient

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 2001, where he founded and chaired the Computational Engineering Science Program 2001-2010. In 2011, he was appointed Professor of Electrical and Computer Engineering at MSU. 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 NPSS Shea

Distinguished Member Award in 2018, the IEEE Plasma Sciences and Applications Committee Award in 2019, and the IEEE Charles K Birdsall Award in 2022.

Prof. Verboncoeur is Past President of the IEEE Nuclear and Plasma Sciences Society, past IEEE Director, past Acting VP of IEEE Publications, Services, and Products Board, VP-elect of IEEE Technical Activities overseeing all 46 IEEE Societies and Councils and about \$500M in revenue. He serves on the Board of Directors for the American Center for Mobility national proving ground. He is Associate Editor of Physics of Plasmas and serves on the DOE Fusion Energy Sciences Advisory Committee. He has led a number of successful startups, including computerized fitness equipment, digital health systems, and distributed publication software, with a role in the USPS mail forwarding system and the consumer credit reports for a big-three credit bureau.

Citation: For pioneering leadership in computational plasma science research, education, student mentoring, curriculum innovation, supportive professional community leadership, and helping to define the field of computational plasma physics.

Early Achievement Award

Cédric Vermontois



Cédric Vermontois
2022 Early Achievement Award Recipient

Cédric Vermontois (S'10–M'12–SM'19) received the Engineering degree in Physics from the Institut National des Sciences Appliquées (INSA), Toulouse, France, in 2008 and the Ph.D. degree in Microelectronics from the Institut Supérieur de l'Aéronautique et de l'Espace (ISAE Supaero), Toulouse, France, in 2012. His Ph.D. research focused on displacement damage-induced degradation effects in CMOS image sensors. He modeled the degradation of the sensor performance parameters, especially the dark current and its associated random telegraph signal and he deduced hardening-by-design techniques to mitigate space radiation effects in CMOS imagers. Cedric presently works for the Centre National d'Études Spatiales (CNES) in Toulouse, France, in the Technology & Digital Directorate. He started as Detection Chain specialist from 2012 to 2018, his work involves the development of imagers for future space imaging missions, electro-optical characterizations, analysis and testing of imagers. He has extended his research to several solid-state imagers dedicated to visible and infrared imaging using ground and in-flight data in order to find generic ways to predict and mitigate space radiation effects. Cédric has also contributed to the understanding and modeling of dark-current Random Telegraph Signals (RTS) in image sensors. He contributed to the discovery of total ionizing dose-induced RTS in silicon-based image sensors. In 2014, he was in charge of the Supercam Remote Micro-Imager, the French contribution to the Mars 2020 Perseverance rover, where he was particularly active to push the selection of the CMOS image sensor for this space mission. Since 2019 he has been recognized as an expert at CNES in the field of solid-state image sensors and radiation effects. In 2021 he became the head of the Opto-Electronic detection department. Cédric has served the IEEE community as a reviewer for the IEEE Nuclear and Space Radiation Effects Conference (NSREC) and for publications in the *IEEE Transactions on Nuclear Science* and *Transactions on Electron Devices*. He has authored or co-authored more than 80 papers in peer-reviewed scientific journals. He has received several awards including the Radiation Effects Early

Achievement award in 2020, four best conference papers and the IEEE Paul Phelps Continuing Education Grant for recognition of contributions to the fields of nuclear and plasma science.

Glenn F. Knoll Postdoctoral Scholar

Thuy Linh Tran



Linh Tran
2022 Knoll Postdoctoral Scholar Award Recipient

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 "Dubna" – Dubna, Russian Federation in 2008. 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 Rozenfeld.

Her research interests include development of semiconductor microdosimeters, relative biological effectiveness (RBE) in proton and heavy ion therapy, Boron 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 62 peer review 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 UOW 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 Career Development Fellowship grant from the Cancer Institute, News South Wales (2022-2025).

Glenn F. Knoll Graduate Scholar Award

Stefano Marin



Stefano Marin
2022 Knoll Graduate Scholar Award Recipient

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 n-γ emission correlations. Stefano's main interest is the implementation of novel analytic techniques for neutron, γ, and charged-particle data. Over the course of his Ph.D., Stefano has experienced many facets of nuclear science research, from designing and performing experiments to working with theorists on improving our understanding of fission. This work resulted in several journal publications.

Stefano has mentored students at all levels during his Ph.D. career, ranging from other graduate 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 there, 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. Rose, respectively.

Edward J. Hoffman Early Career Development Grant

Elena Maria Zannoni



Elena Zannoni
2022 Hoffman Early Career Award Recipient

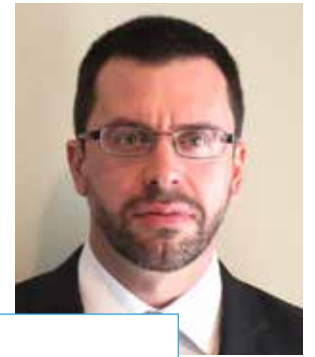
Dr. Elena Maria Zannoni is a postdoctoral research associate at the Nuclear, Plasma and Radiological Engineering Department at the University of Illinois Urbana-Champaign (UIUC), USA, under the supervision of Prof. Ling-Jian Meng. Elena received a B.Sc. degree with honors (2013) and a M.S. degree (2015) in Biomedical Engineering from University of Pisa, Italy. She earned a Ph.D. in Bioengineering at UIUC in 2021. Her research focuses on the development of advanced SPECT imaging systems based on state-of-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 (DE-SPECT) 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 NPSS Edward J. Hoffman Early Career Development Grant will support these developments and short-term visits at the collaborating clinical institutions.

Elena has presented her research at every IEEE MIC since 2017 and in other international conferences, authoring and co-authoring 40+ presentations and workshops. She received young investigator awards for best oral presentations at IEEE NSS/MIC and SNMMI Annual Meetings, and several grants from the IEEE Women in Engineering Society and the NPSS, including, twice, the Valentin T. Jordanov Radiation Instrumentation Award.

Magne "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, pulse-power systems and diagnostics, PIC modeling, and electromagnetic interactions with high-temperature materials. Current research interests involve high-power microwave sources, nonlinear transmission lines (NLTLs), microwave-driven plasmas, applications of additive



Brad Hoff
2022 Kristiansen Award Recipient

manufacturing techniques to HPEM 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.E. 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 Maler



Daniel Maler
2022 Barker Award Recipient

My name is Daniel Maler, 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 Krasik. In 2020 I have transitioned 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 explosion. 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 wire second acceleration without energy input, were explained. Another part of my research is utilizing the advantages of underwater electrical explosions and resulting strong shocks for the generation of supersonic water jet using the explosion of cylindrically and conically symmetric arrays. The observed water jets in experiments reached velocities close to 4 km/s with only few kJ 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 words used to describe the same thing under different conditions.

Mark Twain

Functional Committees Cont. from PAGE 5

Graduate Scholarship Awards

Connor W. J. Bevington



Connor Bevington
2022 Graduate Scholarship
Award Recipient

Connor Bevington is a Ph.D. candidate in the Department of Physics and Astronomy at the University of British Columbia (UBC). He holds a B.S.c (Physics, 2017) from the University of Waterloo and a M.Sc. (Physics, 2019) from UBC. He conducts medical physics research in the UBC PET/MRI Imaging Centre under the supervision of Prof. Vesna Sossi, developing image processing, modeling, and analysis algorithms for Positron Emission Tomography (PET) and MRI, aimed at mitigating noise in the raw data and increasing quantitative interpretability of PET/MRI images. His current projects include improving task-related detection of dopamine release using PET, as well as quantifying brain energetics—the usage and production of energy in the brain—by applying intricate denoising and pattern analysis to PET/MRI images. These methods are being applied to two clinical studies: the first investigates a potential loss of segregation of 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, Connor also holds a NSERC Postgraduate Scholarship, a BC Graduate Scholarship, and several medical imaging conference awards. During his undergraduate studies Connor 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, triathlon, music production, and flying small aircraft.

Jingchen Cao



Jingchen Cao
2022 Graduate Scholarship
Award Recipient

Jingchen Cao was born in Changchun, China. He received B.Eng. (2015) in Information and Communication Engineering from Zhejiang University, Hangzhou, China, and M.Eng. (2018) in Microelectronics and Solid-state electronics from the Institute of Microelectronics (IME), Chinese Academy of Sciences, Beijing China. He is currently pursuing a Ph.D. degree with the Radiation Effects and Reliability group in the Department of Electrical Engineering and Computer Science at Vanderbilt University in Nashville, Tennessee. Jingchen's 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 FF 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 nonvolatile 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).

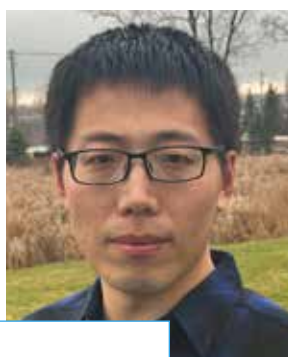
Abbas Jinia



Abbas Jinia
2022 Graduate Scholarship
Award Recipient

Abbas Jinia is a fourth year Ph.D. student in the Department of Nuclear Engineering and Radiological Sciences at the University of Michigan. He is a Physics graduate from Kishinchand Chellaram College, Mumbai, India. In 2018, he earned his master's degree from Purdue University in the U.S. Abbas has distinguished himself in his research productivity. He has authored/ co-authored five peer-reviewed journal articles, four conference papers, and has presented his research at several conferences and workshops. One of his articles has already obtained 35 citations, an outstanding number for a journal paper in our field published only in 2020. Abbas is conducting fundamental research in digital pulse processing and machine learning for active interrogation applications. This research seeks to advance capabilities for detecting concealed special nuclear material. Abbas' research results were selected by the U.S. Department of Energy's National Nuclear Security Administration at their workshop for Next-Generation Artificial Intelligence for Proliferation Detection. In addition to excelling in research, Abbas has served as a graduate student instructor (three times) for NERS 535: Detection for Nuclear Nonproliferation, a laboratory course where students perform radiation detection experiments, data analysis, and Monte Carlo simulations with MCNP and MCNP-POLIMI.

Yang Zhou



Yang Zhou
2022 Graduate Scholarship
Award Recipient

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 few 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 nearby 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

Enxia Zhang



Enxia Zhang
2022 WIE Travel Grant
Recipient

Enxia 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 (SIMIT), Chinese Academy Sciences, in 2006. Enxia worked at SIMIT 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 Assistant 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 built in advanced semiconductor technologies and emerging materials; 2) radiation-induced single events/transients and charge collection in advanced devices; and 3) radiation detection and measurements for space and medical application and detector reliability. Enxia is the author of more than 200 publications on radiation effects in 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 again in 2022, on the NSREC Awards Committee (2018-2020), on the program committee for several meetings of the American Vacuum Society (2012-2014), and on the radiation effects safety committee for Vanderbilt University since 2017. Enxia has also volunteered as a Chinese language and Bible school teacher within the local community.

FINANCE

Operational Committee for the NPSS Fund Established



Roger Fulton
NPSS Fund Chair

NPSS President Steven Meikle 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



Peter Clout
IEEE NPSS Communications
Committee Chair

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 once that is done and our operational committee 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@sydney.edu.au; 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 somebody, 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.

Ron Schrimpf, NPSS Nominations Chair, can be reached by E-mail at ron.schrimpf@vanderbilt.edu.

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, 30,000 women and 400,000 babies die every year associated with infections during child birth due to poor hand cleaning—deaths that could have been prevented if clean water and disinfectants 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—thus supply on-demand clean water for drinking and basic sanitation.



Professor John Foster
University of Michigan, Author

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 nitrites 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 waste-water plants. *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 stage is the application of EPA certification challenge testing for infectious microbes using noninfectious models to the device, optimizing performance and ultimately providing 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 E-mail at jefoster@umich.edu.

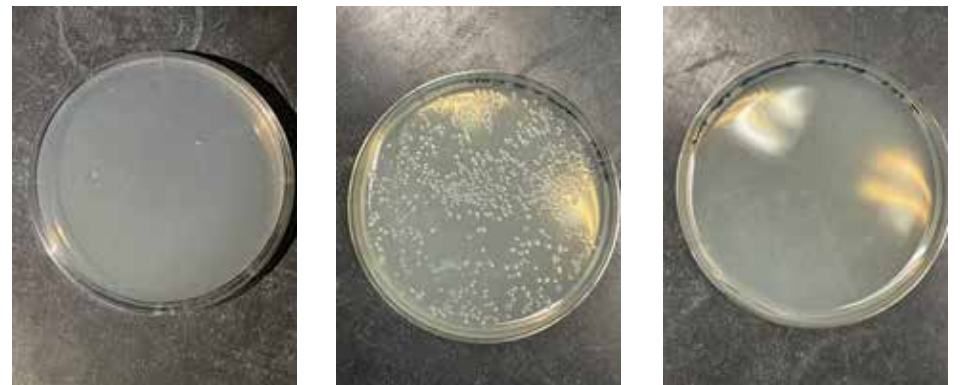
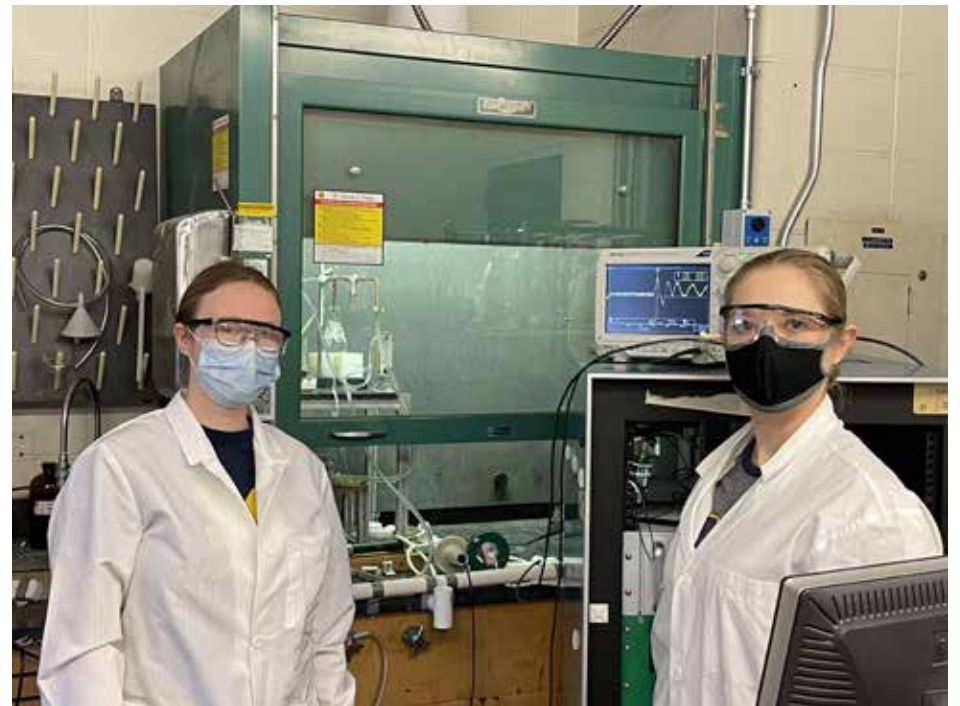


Figure 1. Upper-Graduate students Roxanne Pinsky and Chelsea Tischler. Lower-Experimental results demonstrating disinfection power of plasma wand tool.

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 [4], a topic explored in detail in the NPSS Distinguished Lecturers Program [6].



Dan Fleetwood
Vanderbilt University

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 [7]. During these investigations, Ralph Bray, then a graduate student working with Karl Lark-Horovitz, Chair of the Purdue Physics Department, observed anomalously low spreading resistance around point contacts to Ge. Soon after, using a Ge crystal grown at Purdue, Bardeen and Brattain demonstrated at Bell Labs that this effect was due to minority carrier injection, which could be induced and controlled in a triode configuration (Fig. 1) to form a transistor [1], and of course the rest is history.

Although missing the opportunity to invent the transistor, the Purdue group under the leadership of Lark-Horovitz made many significant contributions to the understanding of semiconductor physics, including early and fundamental research on the effects of ionizing radiation. For example, Fig. 3 shows that neutron irradiation of n-type germanium (curve b) initially causes a decrease in conductance as electrons are removed from the conduction band by the introduction of traps, but at higher fluences the dominant conductivity changes to p-type as a result of point-defect creation. The conductance then increases with fluence, similarly to curve a [8]. Displacement-damage-induced type inversion in germanium and silicon remains important in semiconductor radiation detectors [9].

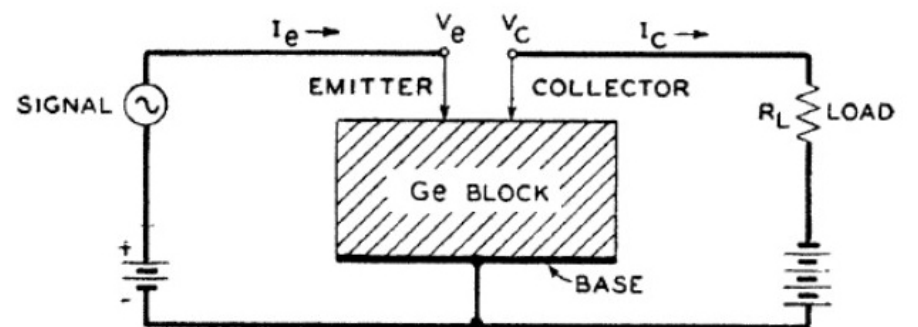


Fig. 1. Schematic diagram of a point contact transistor, implemented in germanium (Ge). (After [1], © American Institute of Physics, AIP, 1948.)

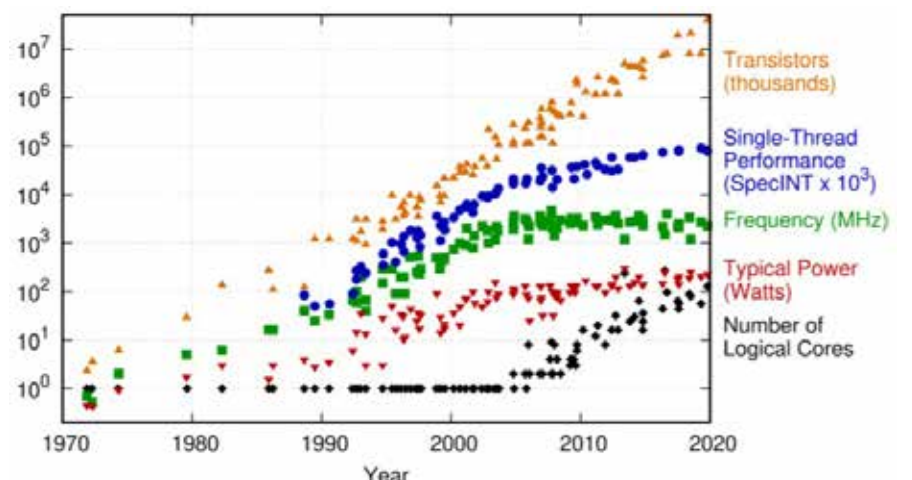


Fig. 2. Transistor count and IC performance, frequency, power, and number of logical cores from 1971 through 2020. The geometrically increasing trend in transistor count reflects Moore's Law scaling. (After [3], [4].)

Transistor

Cont. from PAGE 7

Karl-Lark Horowitz 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-Horowitz Award for graduate research at Purdue is named in his honor; I was fortunate to be a co-recipient in 1984 for my graduate work on low-frequency noise in thin metal films and nanowires. Professor Ralph Bray was my instructor in graduate solid-state physics in Fall 1980. He was enthusiastic in teaching us all about Ge semiconductor physics, and never bitter about missing his opportunity to have potentially been the inventor of the transistor [7], [10]. In fact, he did not even mention 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.

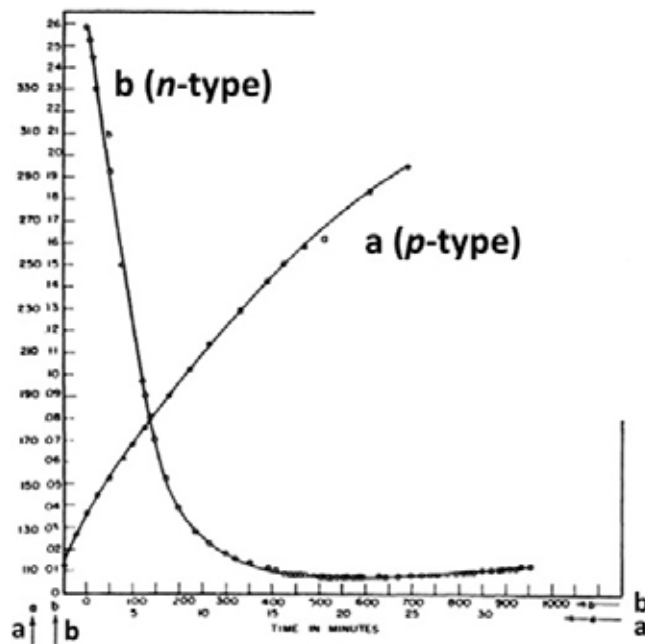


Fig. 3. Conductance of (a) p-type and (b) n-type germanium. (After [8], © AIP, 1949)

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