



NSS-MIC-RTSD 05th-12th November 2022

Please see <https://nssmic.ieee.org/2022/> for the conference program and for registration information. Early Registration ends on September 15th. The conference will

be held in hybrid mode with in-person attendance for the first time since 2019, and with remote connection options.

Contact Chiara Guazzone, General Chair, at chiara.guazzone@mi.infn.it for further information.

2023 IEEE NSREC is Planning for Kansas City, Missouri

The location for NSREC 2023 will be at the Sheraton Kansas City Hotel at Crown Center, Kansas City, Missouri. The home of swing and bebop for some, "The City of Fountains" to others, Kansas City is different things to different people. Music enthusiasts are drawn to the jazz clubs and old haunts of famous musicians such as Charlie Parker and Count Basie. With more fountains than Rome, there are ample opportunities for scenic "strolling from fountain to fountain." Stop along the way to discover interesting neighborhoods and browse through eclectic shops.

of African American baseball players and the National World War I Museum and Memorial. Kansas City spans across the Missouri and Kansas state lines and came to prominence as a port for the Missouri and Kansas Rivers. Today, Kansas City is a burgeoning metropolis with activities and attractions for visitors of all ages and interests.

Come and join us for NSREC 2023 and experience it for yourself. Please visit the redesigned NSREC website www.nsrec.com for 2023 conference details and travel planning tips.

Families are particularly attracted to the city because of its child-friendly events and venues. Science City features hands-on exhibits, while the zoo houses impressive African and Australian exhibits plus an IMAX Theater. The city's museums cover everything from the history of jazz music to a celebration

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NSREC

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NSREC 2023

TECHNICAL PROGRAM

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

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

Basic Mechanisms of Radiation Effects in Electronic Materials and Devices

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

Radiation Effects on Electronic and Photonic Devices and Circuits

- » Single Event Effects
- » MOS, Bipolar and Advanced Technologies
- » Isolation Technologies, such as SOI and SOS
- » Optoelectronic and Optical Devices and Systems
- » Methods for Hardened Design and Manufacturing



Keith Avery
General Chair

- » Modeling of Devices, Circuits and Systems
- » Cryogenic or High Temperature Effects
- » Novel Device Structures, such as MEMS and Nanotechnologies
- » Techniques for Hardening Circuits and Systems

Space, Atmospheric, and Terrestrial Radiation Effects

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

Hardness Assurance Technology and Testing

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

New Developments of Interest to the Radiation Effects Community

RADIATION EFFECTS DATA WORKSHOP

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



Teresa Farris
VP Publicity

PAPER SUBMITTAL

Information on the submission of summaries to the 2023 NSREC for either the Technical Sessions or the Data Workshop can be found at www.nsrec.com. The deadline for submitting summaries is February 3, 2023.

SHORT COURSE

Attendees will have the opportunity to participate in a one-day Short Course on Monday, July 24th. The short course is being organized by Ethan Cannon, The Boeing Company. The course will be of interest both to radiation effects specialists and newcomers to the field.

INDUSTRIAL EXHIBIT

An Industrial Exhibit will be included as an integral part of the conference and will be chaired by Ken LaBel, SSAI, Inc. / NASA Goddard Space Flight Center. Exhibitors will include companies or agencies involved in manufacturing electronic devices or systems for applications in space or nuclear environments, modeling and analysis of radiation effects at the device and system level, and radiation testing. Exhibit and Supporter Registration will open in September!

Conference Committee

Keith Avery
Air Force Research Laboratory
Keith.avery.2@spaceforce.mil

Technical Program Chair

Jonathan Pellish
NASA Goddard Space Flight Center
Jonathan.pellish@nasa.gov

Short Course Chair

Ethan Cannon
The Boeing Company
Ethan.cannon@boeing.com

President's Report

The administrative committee (AdCom) of NPSS recently held its first in-person meeting and retreat since the Covid-19 pandemic began in early 2020. To be more precise, the meeting was held in hybrid mode, like many of our recent conferences, with about half attending in Santa Fe, New Mexico, and half joining remotely via Zoom. While this posed some technical and logistical challenges, the meeting was very successful, thanks in large part to Martin Grossman's A/V skills and Albe and Peter's preparations to make the meeting a safe and enjoyable one for those in attendance. Immediately prior to AdCom, the IEEE Technical Activities Board (TAB) meeting in Bellevue, WA (near Seattle) was attended by me, Vesna Sossi, Peter Clout and John Verboncoeur. I'd like to summarize some of the key items discussed and agreed at these two meetings.



Steve Meikle
IEEE NPSS President

First a brief explanation about AdCom and TAB. AdCom is the decision-making body of NPSS comprising the executive officers (President, Vice President, Past President, Secretary and Treasurer), chairs of each of our eight technical committees (TC), 16 elected members representing those same TCs and the Transnational Committee Chair, chairs of our functional committees, our journal editors and liaisons to various IEEE units and external organizations. You will find the names and contact details of AdCom members on the NPSS web site at <https://iee-npss.org/adcom-info/>. TAB is the forum where all IEEE societies and councils are represented and decisions are made affecting our finances, operations and strategic directions. John Verboncoeur is the current TAB Vice Chair elect and will take over as Vice Chair next year.

At the TAB meeting we discussed a range of challenges and opportunities facing IEEE, such as the impact of COVID-19 on our conferences, the positioning of our journals as scientific publishing moves inexorably towards open access, opportunities for diversity and inclusion, the new IEEE climate change program, governance of humanitarian activities and data sharing and publishing, amongst many others. This was my first opportunity to attend an in-person TAB meeting since the pandemic began; all of my previous TAB meetings having been virtual. There were more than 100 attendees, including the TAB elected officers, society and council presidents, committee chairs, IEEE staff and volunteer guests, all seated in a United-Nations-style arrangement with quite formal application of Robert's Rules of Order. It can be a little overwhelming at first. However, I was impressed by the collegial spirit and the organizational efficiency of the meetings due to the dedication of IEEE staff. It was also nice to put faces to many of the names of people I had engaged with only by email and WebEx up to that point in time.

One of the highlights of the AdCom retreat that followed TAB was a session on STEM outreach for senior school students. This session was led by Dawna Schultz, Senior STEM Outreach Education Manager. Dawna provided an excellent overview of the TryEngineering STEM portal developed by IEEE Educational Activities which makes

resources available to high school students, teachers and IEEE volunteers looking for great outreach activities and resources. She highlighted some resources developed recently in collaboration with NPSS. One of these is a recorded interview with Andrea Gonzalez Montoro, a postdoc previously from Stanford and currently with the Institute for Instrumentation in Molecular Imaging (I3M-CSIC) in Valencia, Spain, who explained the principles of PET in a very accessible way for students and provided them with useful tips for pursuing a career in biomedical engineering and medical imaging. You can find this resource at <https://tryengineering.org/news/biomedical-engineering-and-medical-imaging-tryengineering-tuesday/>. Another interesting resource is a series of interviews with senior engineers and physicists in the medical imaging field performed by a final-year high school student from Australia, Hugo Currie. You can find these interviews at <https://tryengineering.org/engineering-fields/biomedical-engineering/interviews-with-medical-imaging-professionals/>. We will look at ways of extending these resources to other NPSS fields in the near future.

We continued our discussions about the recently established NPSS Foundation Fund which I wrote about in my previous newsletter article. Roger Fulton, our Advisory Committee Chair, led a discussion and breakout group session where we explored the types of society imperatives we'd like to support through the Fund and ideas for raising external funds to increase the number and quality of imperatives it can support. It was a very productive discussion which we will report on in future articles, as well as in the article below under Functional Committees.

Other topics of discussion at our retreat included a report by the 2022 International Conference on Plasma Science (ICOPS) Technical Program Chair, Uri Shumlack, and General Chair, Harilal Sivanandan, on their recent experience of running a hybrid conference. They provided some great insights and lessons learned that our TC Chairs will be able to take advantage of in their upcoming conferences. We also discussed options for transitioning our newsletter from a static PDF format to a more dynamic, interactive format linked to feature articles and resources on our web site. This discussion was led by our Treasurer, Ralf Engels, who has conducted research into the various options and their pros and cons. Following the discussion, we decided to form an ad hoc committee to look further into these options, develop an implementation plan and report back to AdCom.

I will keep you updated in future newsletter articles on these initiatives as we make further progress. In the meantime, I hope you have the same opportunity to resume travel over the coming months as we did

NSREC. Cont. from PAGE 2

Local Arrangements Chair

Sarah Armstrong
NAVSEA Crane
sarah.e.armstrong12.civ@us.navy.mil

Publicity Chair

Teresa Farris
Archon-LLC
Teresa.farris@archon-llc.com

Finance Chair

Nathan Nowlin
Sandia National Laboratories
nnowlin@sandia.gov

Awards Chair

Julien Mekki
CNES
julien.mekki@cnes.fr

Industrial Exhibits Chair

Ken LaBel
SSAI, Inc. / NASA Goddard Space Flight Center
Ken.label@nasa.gov

Social Media Coordinator

Adrian Ildefonso
US Naval Research Lab
adrian.ildefonso@iee.org

Web Developer

Greg Allen
NASA Jet Propulsion Laboratories
gallen@jpl.nasa.gov

Secretary's Report

As Steve discussed the return to an in-person meeting, I will only add that we were once again at the welcoming La Fonda Hotel in Santa Fe, the site of our last in-person meeting in March 2020 when we already had members unable to travel due to Covid.

Overall the NPSS is in good shape financially with income coming from publications and, at a lower scale than in pre-Covid time, from conferences. As Steve mentioned, open access is a looming issue that may well cut into publications revenue. Hybrid conferences are more expensive to operate and the uncertainty related to attendance is high so careful, flexible planning has been needed. While return to pre-Covid normal is hoped for, we have also learned that virtual conferences allow people to attend who otherwise could not because of the expense and time involved with travel and residence at the conference site. There will be more to be learned as we start to meet in-person again, or in hybrid mode –

popular since Covid variants continue to emerge and worldwide vaccination rates are not all that one might wish.

At this point, AdCom plans to meet in person in Milan at the end of the NSS-MIC-RTSD, barring further travel restrictions.

ADCOM ACTIONS

- » The Radiation Effects TC (RE) moves that AdCom approve that the 2022 RADECS (Radiation and its Effects on Components and Systems) conference be an NPSS technically co-sponsored conference. Approved. 19 Y, 0 N, 1 A.
- » RE moves that AdCom approve that NPSS pay the technical co-sponsorship administrative fee for the 2022 RADECS conference. Approved. 21 Y, 0 N, 0 A.
- » FinCom moved that AdCom accept the Initiatives rankings as presented. Approved. 22 Y, 0 N, 0 A.
- » Motions from the Fusion Technology Committee to reduce the number of elected members on their



Albe Larsen
IEEE NPSS Secretary and Newsletter Editor

steering committee and to change language in their Bylaws were withdrawn.

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

President's Report

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and rediscover the tremendous benefits of in-person conferences and events, including socialising with colleagues and friends.

Steven Meikle

Steve Meikle, IEEE NPSS President, can be reached by E-mail at steven.meikle@sydney.edu.au

INDEED, WE HAVE!

We have learned that the present generation of economists has not figured out how the economy works.

Richard A. Posner

AH! THAT EXPLAINS IT

It is impossible to beat an ignorant man in argument.

William G. McAdoo

...OR IS WILLING TO LISTEN

The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom.

Isaac Asimov

Technical Committees

RADIATION INSTRUMENTATION STEERING COMMITTEE

The transition back to in-person or hybrid (accommodating both in-person and virtual attendees) continues; with this transition comes new challenges and opportunities. With COVID-19 cases continuing to ebb and flow, we must continue to be patient and flexible with all of these plans. COVID-19 protocols for in-person attendance at our conferences will almost certainly continue to track these ebbs and flows, so please watch for and read closely any messages from conference organizers to ensure you know what will be required. Similarly, hybrid conferences offer new opportunities to be more inclusive in our reach, while at the same time being the most expensive conference format and the most difficult for predicting attendance. Our hope is that our attendees and their home institutions will remember and continue to value the in-person benefits of our conferences—the networking, the more in-depth exchanges regarding our research, and the scientific creativity that comes with bringing large numbers of researchers together to share their advances—and that the virtual offering will primarily be for those who would not be able to attend the conference otherwise.



John Valentine
RISC Chair

With the above in mind, we are very much looking forward to welcoming the entire community to the 2022 Nuclear Science Symposium, Medical Imaging Conference, and Room-Temperature Semiconductor Detector conference NSS/MIC/RTSD - <https://nssmic.ieee.org/2022/> at the Milano Convention Centre, Milano, Italy, from November 5th–12th. The Organizing Committee, led by General Chair Chiara Guazzoni, has been working diligently to ensure that all attendees, in-person and virtual, will feel welcomed and find the experience to be of extremely high scientific and professional value. As always, the health and wellness of our attendees is paramount and we will continue

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Technical Committees

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to monitor public health guidance and adjust plans and protocols accordingly so continue to check the conference web site and read the emails sent by the conference organizers to get the latest updates.

In addition, 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. SCINT 2022 is an IEEE technically cosponsored conference.

We are also pleased to announce that IEEE will once again technically cosponsor the 2023 edition of the Advancements in Nuclear Instrumentation Measurement Methods and their Applications ANIMMA 2023—<https://animma.com/>. Abdallah Lyoussi will be the General Chair for this 8th edition of ANIMMA and the conference is being planned for June 12th–16th, 2023 in Real Collegio, Italy. We look forward to another outstanding scientific and social program at ANIMMA 2023!

Finally, be on the lookout for your annual ballot for electing Radiation Instrumentation Technical Committee (RITC) member to positions on both the Radiation Instrumentation Steering Committee (RISC) and the Administrative Committee (AdCom) of the Nuclear & Plasma Science Society (NPSS). Every year we elect five new RISC Members-at-Large to serve three-year

terms. In addition, this year one of RITC's two elected AdCom positions is up for election, replacing Sara Pozzi whose term is ending. It is critical that you vote for these positions! The people elected will be in these positions to serve you, the members of RITC.

More information on the Radiation Instrumentation Technical Committee is available at <https://ieee-npsc.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

Society Awards



Stefan Ritt
Awards Chair

The deadline for most of our 2023 NPSS Awards nominations is quickly approaching on Jan. 31st, 2023. Please consider nominating somebody for one of our prestigious awards or grants. Members of our community are eligible for a number of awards for exceptional contributions to our field or our Society. These include the highest IEEE level awards, such as the IEEE Medal for Healthcare Innovations and Technology and the IEEE Marie Skłodowska-Curie Technical Field Award, our Society awards, and numerous Technical Committee and Conference awards. Information about all of these awards and tips on how to write a successful nomination can be found on the NPSS website <http://ieee-npsc.org/awards/>

There are also a number of grants sponsored by NPSS that are designed to help students and young researchers attend various NPSS conferences and Short Courses. The Paul Phelps Continuing Education Grants provide funds

for students, postdocs, and unemployed NPSS members to cover the cost of tuition and other expenses for Short Courses offered at NPSS conferences. The NPSS Women in Engineering Leadership Development Travel Grant is meant to help women in their mid-level to senior phases of their careers by sponsoring the participation to the IEEE Women in Engineering International Leadership Conference. Many of the NPSS Technical Committees sponsor student awards and travel grants, and many of our conferences also offer NPSS Student Paper Awards for outstanding student contributions at our conferences. Details on how to apply for these awards and grants are given on the NPSS Awards web site.

Please nominate one of your colleagues, or yourself, for one of the many NPSS awards or grants (self nominations are allowed for some of the awards; details can be found in the award descriptions). It's a great opportunity to recognize some of the many outstanding colleagues in our field and to raise the level of prestige of our Society. Some of our awards have seen very few or even no nominations in the past, so chances to get one of those are not small given a good nomination package. Visit the NPSS Awards website <http://ieee-npsc.org/awards/> for details of each award, nomination forms, and submission instructions.

Stefan Ritt, IEEE NPSS Awards Chair, can be reached by E-mail at Stefan.ritt@psi.ch.

Technical Committee Award Recipients

Fusion Technology

2022 NPSS Fusion Technology Award



Dennis Youchison
2022 Fusion Technology Award Recipient



Carl Pawley
FTC Awards Chair

The NPSS Fusion Technology Committee proudly announces Dr. Dennis Youchison as the 2022 Fusion Technology Award recipient. Dr. Youchison has made pioneering contributions to the field of high-heat flux (HHF) technological solutions, and played a key role in

Functional Committees

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the nurturing and early implementation of public-private partnerships in the U.S. fusion energy program. He is a recognized and highly regarded leader in the field of HHF testing and has provided leadership in fusion science and technology, most recently as the director of the Innovation Network for Fusion Energy (INFUSE) program.

Dr. Youchison will receive his plaque and award during the 2023 SOFE conference in Oxford, England. Nominations for the 2023 Award will open in early 2023. This award will also be presented at the 2023 meeting.

Radiation Effects

2022 Phelps Award Winners

2022 Paul Phelps Continuing Education Grants were awarded to three student members and one postdoctoral scholar from the radiation effects community. At the opening of the NSREC Conference (July 18th, 2022), Robert Reed, Chair of the Radiation Effects Steering Group, announced the grant awards. The grants included tuition for the 2022 NSREC Short Course and a check for \$750.

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

The four recipients of the 2022 Paul Phelps Continuing Education Grant were Jingchen Cao, Cosimo Campanella, Andrea Coronetti, and Alexis C. Vilas Bôas.

Jingchen Cao was born in Changchun, China. He received a B.Eng. (2015) in Information and Communication Engineering from Zhejiang University, Hangzhou, China, and an 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 and Computer Engineering at Vanderbilt University in Nashville, Tennessee. Jingchen's research interests include 1) developing and



Jingchen Cao
2022 Phelps Award Recipient

verifying a surface-potential-based compact model of 2D Material field effect transistors, 2) evaluating single event response of FF designs in advance bulk FinFET technologies for exposures which include alpha particles, fast neutron heavy-ion and so on, and 3) total ionizing dose effects and reliability mechanisms for advanced nonvolatile memory devices. Jingchen has over 20 publications in the field of electrical engineering, and 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).



Cosimo Campanella
2022 Phelps Award Recipient

Cosimo Campanella graduated in Electronic Engineering at Politecnico di Bari (Italy) in 2018, after a master internship in Spring 2018 on radiation effects on optical amplifiers at the Laboratoire Hubert Curien with the MOPERE team (Materials for Optics and Photonics in Extreme Radiation Environment). After that, he started a Ph.D. thesis with the same group under the supervision of Prof. Aziz Boukenter and Prof. Franck Mady (from the INPHYNI lab in Nice, France). His work involves studying the combined effects of radiation, hydrogen and temperature on various passive optical fiber types, from the radiation hardened ones to the sensitive ones. During his Ph.D. program he published, as first author or co-author, 18 publications in scientific journals. Cosimo's Ph.D. thesis is funded by the PIA-ANR project CERTYF, led by the Université Jean Monnet in close collaboration with ANDRA (Agence nationale pour la gestion des déchets radioactifs), IRSN (Institut de radioprotection et de sûreté nucléaire) and the Université de Côte d'Azur.



Andrea Coronetti
2022 Phelps Award Recipient

Andrea Coronetti completed his Ph.D. in November 2021 within the EU funded RADSAGA (RADiation and reliability challenges for electronics to be used in Space, Avionics, Ground and Accelerators) program. The Ph.D. was awarded by the University of Jyväskylä, Finland, and the title was "Relevance and guidelines of radiation effect testing beyond the standards for electronic devices and systems used in space and at accelerators." The core activity was achieved at CERN under the supervision of Dr. Rubén García Alía, from CERN, and Dr. Arto Javanainen, from University of Jyväskylä. The main outcome of the dissertation research was the tailoring of a guideline for system-level testing of space systems by means of high-energy hadrons that was released in October 2020. Andrea also dealt with several research activities across the space and accelerator fields, such as proton direct ionization and its impact in space and accelerators, pion indirect ionization and its impact in accelerators, and the use of high-energy hadrons as a proxy to high-energy heavy ions. Andrea is currently working as a joint post-doc between CERN and the University of Montpellier on several Ph.D. thesis research spin-offs. He is also engaged on some new projects, such as RADNEXT (the European radiation effects in electronics facility infrastructure) and CHIMERA (a project aimed at providing high-energy ions suitable for radiation testing of highly advanced packaging devices at the CHARM facility at CERN). Finally, he has been appointed as Data Workshop chair for the 2023 NSREC conference.



Alexis C. Vilas Bôas
2022 Phelps Award Recipient

Alexis C. Vilas Bôas is a science and engineering enthusiast. Alexis, at age of 28, holds a master's degree

Functional Committees

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in electrical engineering, with an emphasis on integrated circuits, at FEI University. He is currently pursuing a Ph.D. on the effects of ionizing radiation on electronic devices, with a focus on comparing the most promising technologies for high electronic mobility transistors: Gallium Nitride (GaN) and Silicon Carbide (SiC). In the year in which he graduated, he was considered the best student in his class, being awarded by the Brazilian engineering agency (CREA). During his master's degree, he was chosen to present his findings at two major symposiums in the area: RADECS, in Montpellier, France, and SERESSA, in Seville, Spain, where he received the award for the best work presented. Alexis dreams of one day being able to contribute to the expansion of humanity into space, through his studies on electronic devices robust to radiation effects.

For further information about Radiation Effects awards, contact Teresa Farris, Vice Chair, Publicity, at teresa.farris@archon-llc.com

Technical Committee Calls for Award Nominations

Plasma Science and Applications



Brad Hoff
Awards Chair, PSAC

The Plasma Science and Applications Committee (PSAC) Executive Committee (ExCom) is soliciting nominations for candidates to serve as a student representative on the PSAC ExCom. PSAC is one of the eight technical committees of the IEEE Nuclear and Plasma Sciences Society and is responsible for the annual IEEE International Conference on Plasma Science (ICOPS) as well as providing guidance to the editor-in-chief of the *IEEE Transactions on Plasma Science*.

Student representatives are selected annually and will serve a two-year term as a nonvoting member of the

ExCom. Their role is to help promote student outreach and to enhance the diversity of viewpoints represented at ExCom meetings, and they are encouraged to fully participate in all discussions. The ExCom holds either virtual or hybrid meetings twice a year, the first in May at the ICOPS, and the second in the October-November timeframe. Travel support to attend ExCom meetings in person may be provided on the same basis as for other members of the ExCom.

Please contact Brad Hoff, the PSAC ExCom Nominations Subcommittee Chair (brad.hoff@ieee.org), with any questions or with student candidate nominations. There is presently no formal nomination process; however, it would be very helpful if you could provide name, email address, status (pre-comps, post-comps, finishing up, etc.) and two to three sentences regarding the relevance of their work and future career plans to the IEEE plasma sciences community. Additionally, while a student candidate does not need to be an IEEE NPSS member at the time of nomination, they will be expected to join IEEE NPSS upon notification of selection. Nominations should be received by Monday 03 October 2022.

Brad Hoff, PSAC Awards Chair, can be reached by E-mail at brad.hoff@ieee.org.

FOUNDATION FUND

IEEE Board Approves Funding for the Nuclear and Plasma Sciences Society Fund. Donations Accepted!



Peter Clout
NPSS Fund Committee



Roger Fulton
NPSS Fund Chair

At their June meeting, the IEEE Board approved the further funding of the new NPSS Fund by NPSS of up to \$80k immediately and up to another \$80k next year. The exact amount of the transfer will depend on the financial outcome for each year. This is the second step in the expansion of our educational, outreach, diversity, and humanitarian imperatives as they further develop into regular activities of NPSS volunteers.

Another use of the NPSS Fund is covering our initiatives and imperatives in years where unusual events greatly reduce the traditional sources of initiative funding.

We are planning a fundraising program that was discussed at the NPSS AdCom meeting series held recently and is likely to get underway later this year when all the details are resolved. We are looking for donations of all sizes and these can be made now by going to: ieeefoundation.org/donate and selecting "Nuclear and Plasma Sciences Fund" from the drop-down designation box. The first individual donations are already coming in.

One imperative that has need of this fund is the Instrumentation Summer Schools. These have been very well received and successful, and several are being organized for each year now that the pandemic seems to be cooling. However, these instrumentation schools only cover a small part of our field of interest and they are currently organized by just one of our eight technical committees.

The IEEE Board of Directors will be asked to permit NPSS to match external donations to the Fund. The result will be that every dollar donated gets doubled by NPSS. Please look out for the announcement of further details as they become available.

Remember, go to ieeefoundation.org/donate and select "Nuclear and Plasma Sciences Fund" to help expand our corner of the large electrical engineering profession.

Peter Clout can be reached by E-mail at p.clout@ieee.org; Roger Fulton can be reached at roger.fulton@sydney.edu.au.

THE LIMITS OF SAVANTS

When a scholar goes to seek out a bride, he should take along an ignoramus as an expert.

The Talmud

THE ROSY VIEW

What passes for optimism is most often the effect of an intellectual error.

Raymond Aron

In Memoriam



Ronald J. Jaszczak
23 August 1942–27 May 2022

COLLECTIVE REMEMBRANCES OF RONALD J. JASZCZAK

Ron Jaszczak was a pioneer in nuclear medicine instrumentation and methods. After his work in gamma camera and SPECT instrumentation development at *Nuclear-Chicago* and *Searle*, he took on a faculty role at Duke University where he undertook pioneering SPECT research while he trained a generation of nuclear medicine physicists and research scientists. Research accomplishments alone are not Ron's only legacy, but rather his personality and approach to science were an inspiration to many. We would like to share some of our experiences and remembrances as a tribute to him.

Several of us first got to know Ron personally during our interviews for a postdoctoral position in his SPECT Research Lab at Duke. One of us met Ron for breakfast at 7 am after flying in from the West Coast the night before. About halfway through the meal Ron turned his head and remarked that it was only 4:30 am Pacific Time. It was never clear whether this was Ron's dry sense of humor or whether he had just realized this time difference. Another of us recalls that he came over from the Duke physics building on very short notice for an interview and managed to utter about four sentences the entire hour as Ron talked away. Afterward a postdoc relayed back that Ron said "he seems like an honest guy." This was good enough to be hired! A third one of us recalls that his interview/presentation at Duke was a trial by fire, where Ron asked his usual incisive questions as at SNMMI and IEEE meetings. Ron appreciated a good discussion about science and always probed the details. He could befuddle speakers with simple questions that had difficult answers or which had solutions he had demonstrated long before.

Ron had an incredible amount of energy and enthusiasm. It was both energizing and exhausting when working with him! If you think about the things that make a stereotypical good mentor, Ron wasn't any of those things. He didn't sit you down and explain

your project or the big picture; he didn't have regular meetings, etc. But if you went to ask him a question he'd spend hours with you talking about all sorts of stuff, some connected and some not, but all interesting and insightful. We would have intense discussions about his children, financial and real estate investing, vacations (especially deep-sea fishing, which he loved) and his siblings, with maybe 15 minutes devoted to the actual answer about SPECT research or clinical topics. When we were working on abstracts and journal manuscripts Ron would typically return a draft to you the next day (he never seemed to sleep). You typically got it back with more red inked comments than the original black text! After an academic workday including abstract or grant submissions, he would be off to spend some time at *Data Spectrum Corp.*, the company he founded with his wife Nancy, or go home and quite literally rip out the attic insulation and replace it! He was a constant force moving forward, guiding the SPECT ship. And when things didn't necessarily work, he would invoke "Damn the torpedoes, full speed ahead!" He had a "never give up" attitude toward everything.

Ron was an objective and enthusiastic scientist/entrepreneur, and spoke passionately about science, experimentation, simulations and their impact on improving clinical imaging. He promoted the work of his lab members by encouraging experimental verification. He made the *Trionix* Triad SPECT scanner and all of its resources available, including the assistance of Kim Greer, who worked for many years in Ron's lab as a well-published research nuclear medicine technologist. Having great physical insight, Ron was very pragmatic about research efforts, a reflection in part of his experience in industry. He appreciated the value of simulations but emphasized that one should perform suitable experiments to make sure that they reflected reality. When others talked about possible ways of improving SPECT imaging instrumentation, Ron had often already begun or even completed building them. He tried covering all his bases when it came to research, and especially for grant submissions. His thoroughness and thoughtfulness paid dividends in his many first-round funded grants, which we all got to participate on and learn from, and the research and clinical impact they ultimately produced.

One of Ron's most significant achievements was coining the term "SPECT", of which he was incredibly proud (it was also his hot red convertible's vanity license plate). He said he was inspired by the still nascent PET, and wanted to have an acronym that distinguished tomographic single photon imaging. It has since migrated from acronym to a well recognized word in medicine. Another significant achievement was development of his namesake "Jaszczak phantom," with its cold spheres and cold rods. This phantom was easy to load and image and became a standard for SPECT system evaluation,



Martin Tornai
Contributor



Mark Smith
Contributor



David Gilland
Contributor



Timothy Turkington
Contributor

especially in a clinical setting. Before its introduction it was often difficult to fairly compare the performance of different imaging systems in an easily understandable way. Ron first realized the importance of QC and phantoms when still in industry. He was frustrated with SPECT image quality at initial installed sites due

to personnel not doing the extra QC needed for high quality SPECT imaging, including uniformity and center of rotation calibrations.

At conferences Ron was often thought of as one of the most intimidating questioners. But the truth was that if you were prepared, there was no question you couldn't respond to, and it was perfectly acceptable to him to say that you didn't know an answer. All of us vividly recall our oral presentation practices in the lab conference room: Ron would often find the holes in our work and encouraged thoughtful critiques from all of us. Of course, those could be fearful moments as we were grilled, but they prepared us well for any question that we might encounter at a conference. You could often count on Harry Barrett, Tom Budinger, Grant Gullberg, Ron Huesman, Ben Tsui or another leading nuclear medicine scientist coming up to the microphone and asking you a question, commenting on your talk or pointing out something that was not quite right (which is as it should be). Having Ron on our side was one less "giant" we had to contend with at conferences!

Ron was not all "business," as he also had a fun side that most people may not have known. He threw yearly Super Bowl parties, entertaining employees of his company (whom he treated like family) as well as everyone he worked with at Duke. He loved showing off his Polish Pomeranian dogs and his unopened bottle of *Louis XIII* cognac. He finally opened this bottle with Ben Tsui, when Grant Gullberg visited Duke the year Ron officially retired in 2010. Ron and his close friend Ed Hoffman could often be seen together with their wives enjoying the sights and sounds of the technologist parties at the SNMMI Annual Meeting. We all worked hard in the lab, but it was a fun place with good camaraderie.

Ron was an excellent career mentor, though we may not have realized all of his efforts at the time. He gave all of us a wide berth to investigate relevant topics and encouraged us to develop our own approaches to solving problems, but always brought us back to fundamentals if we strayed too far. He shepherded junior faculty with his graduate students, giving us opportunities to mentor and participate on doctoral committees. He really showed us how the academic system worked and looked out for our future by having us teach the Duke residents about nuclear medicine physics. This was great experience since we learned pretty quickly that it wasn't like teaching physicists or engineers! People from the Jaszczak lab went on to careers in academia and industry, with many taking faculty positions in some aspect of medical physics.

Lastly, Ron loved being involved with the *IEEE Nuclear & Plasma Science Society*, especially on the Administrative Committee (AdCom), and was even Chairman of the *IEEE Medical Imaging Conference*. He relished talking

about the professional and personal friendships he made through AdCom and the *IEEE NPSS* over the years. He looked forward to the meetings in different cities, deciding on the directions of the society. With all of his work it seemed almost unimaginable how he could maintain all of his personal and professional commitments and friendships. He was an amazing individual, and we are lucky to have gotten the chance to share part of our lives with him.

Martin Tornai, Mark Smith, David Gilland, Timothy Turkington contributed to this article. For additional information, contact Martin Tornai by E-mail at martin.tornai@duke.edu

DONALD "BRUCE" MONTGOMERY, INFLUENTIAL ELECTROMAGNET ENGINEER, DIES AT 89



Donald "Bruce" Montgomery
1 July 1933–1 July 2022



Martin Greenwald
Author

Longtime MIT researcher and former associate director of the Plasma Science and Fusion Center contributed to fusion energy progress on campus and around the world.

Donald "Bruce" Montgomery SM '57, a highly influential engineer and longtime MIT researcher, the first recipient of the NPSS Fusion Technology Award, whose career was focused on the development of large-scale electromagnets, died on July 1st, 2022. He was 89.

Montgomery's contributions have been pivotal for numerous major facilities in fusion energy, in the

design of magnets for particle accelerators for physics and medical applications, for magnetically levitated transportation, and in many other disciplines. He was a recognized international leader in magnet design and fusion engineering, a member of the National Academy of Engineering, and recipient of numerous awards including the Dawson Award for Excellence in Plasma Physics Research (1983) and the Fusion Power Associates Distinguished Career Award (1998).

Montgomery graduated with a BA from Williams College and an MS from MIT in the Department of Electrical Engineering in 1957. In 1967 he received an ScD from the University of Lausanne.

Following his graduation from MIT he joined the staff of MIT Lincoln Laboratory, and shortly after began work on high-field magnets under Francis Bitter, renowned magnet designer and founder of the National Magnet Laboratory at MIT. Montgomery rose to become the associate director of what was later renamed the Francis Bitter National Magnet Laboratory. During this period he authored the book "Solenoid Magnet Design: The Magnetic and Mechanical Aspects of Resistive and Superconducting Magnets," which remains a standard reference.

A turn toward fusion

Montgomery's expertise was next harnessed to a growing program in fusion energy. Following the measurement of plasma temperatures exceeding 10 million degrees in the Soviet T3 tokamak, a race was on to build ever more capable magnetic confinement experiments. Working with Bruno Coppi of MIT's physics department and Ron Parker from electrical engineering, Montgomery led a team that designed and constructed two tokamak devices capable of operating with magnetic fields up to and exceeding 12 tesla, still today an unprecedentedly high magnetic field for fusion research. The initial device, known as Alcator A, set a world record for the key plasma confinement metric. The follow-on device, Alcator C, extended this record in the 1980s and gave confidence that plasma conditions sufficient for a fusion power plant could indeed be achieved.

The record-setting performance by both devices was made possible by the use of breakthrough magnet technology developed with Montgomery's insight and leadership. One can draw a straight line between these early breakthroughs in magnet technology and the resultant scientific progress that they enabled to the further evolution of magnet technology being used in SPARC, a demonstration fusion device led by MIT and spinoff company Commonwealth Fusion Systems that is designed to produce more energy than it consumes.

In Memoriam

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Montgomery also had a well-recognized ability to manage very large projects and to lead diverse groups of scientists, engineers, technicians, and students. As a result he was appointed chief engineer on several national fusion system construction projects and had a leadership role in the early days of the international fusion project known as ITER. In the 1990's he led one of the three national consortia teams vying to develop maglev technology under the U.S. Department of Transportation Maglev Initiative.

Creating a revolutionary cable

While at the National Magnet Lab, Montgomery, Henry Kolm, and Mitch Hoenig invented the concept for the cable-in-conduit-conductor (CICC). In those early days of large-scale superconducting magnet research, large-bore, high-field superconducting magnets were built in a type of brute-force method. These older designs were unstable and unsuitable to the need for ever higher magnetic fields, and larger sizes increase the performance of magnetic confinement fusion machines. This technology was impeding advancement, especially for the tokamak's poloidal field magnets which were required to deliver rapidly changing fields.

Montgomery, Kolm, and Hoenig solved these problems by combining many superconducting wires into a cable, using standard industrial equipment, and then putting the cable inside a steel or other high strength metal alloy tube (conduit). The magnet was cooled down and maintained at 4 K by flowing supercritical helium within the conduit. Since each conductor could be insulated against high voltages, large-bore, high-field, high-stored-magnetic-energy magnets could be safely protected from quench. The strong metal alloy conduit provided high mechanical strength distributed most optimally throughout the winding cross section. And the flowing helium provided excellent heat transfer from all the superconducting wires in the cable, resulting in very

high electrothermal stability, especially for fast ramped magnets.

Although the CICC concept was deemed heretical within the international applied superconductivity community and dismissed as impractical, under Montgomery's leadership the MIT group rapidly developed and proved the concept. Today, every working fusion device in the world that uses superconducting magnets employs this conductor, including tokamaks (e.g., EAST, KSTAR, JT60-SA), helical machines (LHD), and stellarators (Wendelstein 7-X). It is the baseline conductor design for ITER and has found application in particle accelerators and magnetic levitation.

Exploring magnetic levitation and propulsion

In the 1970's, Montgomery and Kolm from the Francis Bitter Magnet Laboratory collaborated with Richard Thornton from the MIT Department of Electrical Engineering in formulating the "magplane" concept of magnetic levitation and propulsion. An early demonstration of a model scale device was built and tested on MIT's athletic fields. Montgomery and Henry Kolm later founded Magplane Technology, Inc. (MTI) a small company focused on developing advanced applications of magnetic levitation and propulsion. A working version of this technology was built in China, where it was used to deliver coal from coal mines, avoiding the excessive coal dust and waste resulting from open trucking vehicles. In the 1980's, Montgomery worked with Peter Marston and Mitch Hoenig, leading an MIT team developing very large-scale superconducting magnets for magnetohydrodynamic electric power generation.

Engineers and scientists know that failure can be the best instructor. Montgomery took that lesson to heart, diagnosing failure mechanisms in large magnet systems and authoring several meta-studies which analyzed and tabulated the underlying causes. This work allowed engineers to focus on the most critical aspects of their designs and contributed to the growing reliability of

research magnets. After his retirement from MIT in 1996, Montgomery was the founder and president of MTECHNOLOGY Inc., an engineering consultancy which specializes in risk and reliability.

An engineer's engineer

Joe Minervini, one of Montgomery's proteges, notes: "Bruce was considered by me and most people who knew him to be an 'engineer's engineer.' Although he always possessed a deep scientific understanding of the technology problem he was attacking, he always seemed to formulate a brilliant but practical engineering solution. Over his long career at MIT, he demonstrated this time and again on many of the most advanced and challenging new technologies built around conventional and superconducting magnets."

Beyond the breadth of his technical contributions and committed mentorship, Bruce Montgomery will be remembered for his warm personality and his calm, steady demeanor, which was of inestimable value when things got tough — a common occurrence when pushing the envelope in research. He had a unique ability to take control of contentious technical and management discussions and to gently pull or push everyone to an effective consensus and into action. He will be sorely missed by his friends, family and colleagues.

Montgomery is predeceased by his wife of 52 years, Nancy Ford Fenn, who passed away in 2006, and by Elizabeth Bartlett Sturges, with whom he spent many happy years until her passing in 2021. He is survived by his son Timothy Montgomery and his wife Susan of Scituate, Massachusetts; daughter Melissa Sweeny and her husband Tom of Groton, Massachusetts; as well as his grandchildren, Jenna Sweeny, Christopher Sweeny, and Benjamin Sweeny.

Martin Greenwald, who prepared this article, can be reached by E-mail at g@psfc.mit.edu

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NEWSLETTER EDITOR:

Albe Dawson Larsen
 E-mail: amlarsen@slac.stanford.edu

Contact Information for all AdCom members can be found on our web site: <https://ieee-npss.org/>

CONTRIBUTORS LISTED ALPHABETICALLY:

Cosmo Campanella, Jingchen Cao, Peter Clout, Andrei Coronetti, Teresa Farris, Roger Fulton, David Gilland, Martin Greenwald, Brad Hoff, Albe Larsen, Steven Meikle, Carl Pawley, Robert Reed, Stefan Ritt, Mark Smith, Martin Tornai, Timothy Turkington, John Valentine, Alexis C. Vilas Bôas

CONTRIBUTED ARTICLES

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