

Sandra G. Biedron - Curriculum Vitae – January 2020

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Name and Contact

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Brief Listing of Research and Career Interests

Science and technology advancement

Facilitating global science and technology environments for the United States and its Allies

Technology incubation and transfer

Science and technology history and education

Systems engineering and project management

Applications of particle and laser beams

High-gain, single-pass, free-electron lasers

Aircraft applications and design

Design, construction, upgrades, and extensions of existing laser and accelerator facilities

Operation of user-driven accelerator and laser facilities

Controls (Traditional and Advanced – Data Science/Artificial Intelligence Inspired)

Machine Learning

Development of analytical research tools

Security Clearances Previously Held

U.S. Secret

NATO Secret

Education

Lund University

Graduate Physics, Ph.D. in Accelerator Physics 2001.

Dissertation: Toward Creating a Coherent, Next-Generation Light Source with special emphasis on nonlinear harmonic generation in single-pass, high-gain free-electron lasers, ISBN 91-7874-167-X, <https://lup.lub.lu.se/search/publication/42149>.

Trinity Christian College

Majors: Chemistry and Biology. Minor: Mathematics. B.A. 1994.

Training and/or Certifications Necessary for Some Federal Contracts and Access to National Laboratories

- ◆ Joint Staff-US007 – Level I Antiterrorism Awareness Training
- ◆ American Heart Association – CPR and AED Certified, Healthcare Provider, Basic Lifesaver (BLS) – 4 Hours
- ◆ First Aid – Basic Casualty Care (BC2 – First Aid) – 4 Hours
- ◆ Level B – Code of Conduct SERE Training, Naval Education and Training Command - Survival, Evasion, Resistance, and Escape (SERE)
- ◆ Authorized Climber – Tower Climber (OSHA 1910.268, ANSI Z359, NATE CTS)
- ◆ Fermilab – Radiation Protection - GERT - General Employee Radiation Training
- ◆ Fermilab – Sexual Harassment Awareness and Prevention for Fermilab Users, Visitors and Contract Employees
- ◆ Fermilab – Environmental Protection - NEPA for Everyone
- ◆ Fermilab – Export Control Awareness
- ◆ Fermilab – Counterintelligence Training
- ◆ Fermilab – Technical Publications Training
- ◆ Fermilab – Emergency Management - Workplace Violence and Active Shooter/Active Threat Awareness Training
- ◆ Fermilab – Basic Computer Security
- ◆ Fermilab – Protecting Personal Information at Fermilab

- ◆ Fermilab – Computer Security Anti-Phishing Training
- ◆ Brookhaven National Laboratory – Cyber Security Training
- ◆ University of New Mexico – Harassment and Discrimination Prevention - 2019E
- ◆ University of New Mexico – Active Shooter on Campus: Run, Hide, Fight - 2019
- ◆ University of New Mexico – Securing Private Data (Web Course)
- ◆ University of New Mexico – Basic Annual Safety Training - 2019
- ◆ University of New Mexico – Grants Management Training Online
- ◆ University of New Mexico – Effort Certification Training for Certifiers (PI's)
- ◆ University of New Mexico – Ethics: A Framework for Ethical Decision Making
- ◆ University of New Mexico – Intersections: Preventing Discrimination and Harassment - 2018
- ◆ University of New Mexico – Active Shooter on Campus: Run, Hide, Fight - 2018
- ◆ University of New Mexico – Basic Annual Safety Training - 2018

Significant Honors and Awards

Moraine Valley Community College Alumni Hall of Fame. The Hall of Fame honors Moraine Valley alumni who have achieved success in their career and provided service to their community. www.morainevalley.edu/alumni/hall-of-fame/. *To be presented 19 February 2020.*

Invited Delegate and Speaker, International Expert Meeting focused on the Use of Free Electron Lasers and Beyond: Scientific, technological, and Legal Aspects of Dual Use in International Scientific Cooperation, 4-5 November 2019, Hamburg, Germany.

Invited Delegate and Speaker, U.S. State Department Event — U.S.-European Extreme Light Infrastructure (ELI) Dialogue, February 21-22, 2019 at the ELI Beamlines Facility, Dolni Březany, Czech Republic.

IEEE Nuclear and Plasma Sciences Society (NPSS) Particle Accelerator Science and Technology Award, Citation: “For broad impact in accelerator science and technology.” Awarded May 2018.

The IEEE Nuclear and Plasma Sciences Society awards the Particle Accelerator Science and Technology Award to individuals who have made outstanding contributions to the development of particle accelerator science and technology. Two Awards are granted in each occurrence of the Particle Accelerator Conferences held in North America (PAC or IPAC). At least one award will be given to an individual early in his/her career.

District 230 Foundation, Orland Park, Illinois, District 230 Foundation Legacy Hall Inductee, for her contributions to Science and Technology, inducted 17 April 2015.

District 230 recognizes alumni who have used their education and experience to become successful, positive contributors to society. District 230 Foundation Legacy Hall was established to recognize and showcase graduates who exemplify the core mission of District 230: adults prepared to realize their life-long potential in an ever-changing world. Through Legacy Hall we recognize those individuals who have created a legacy for current and future students to follow in the halls of District 230. www.d230foundation.org/legacy-hall.html

Appointed as Government Relations Sub-Committee Chair for the User’s Executive Committee of the Department of Energy’s Fermi National Accelerator Laboratory User’s Organization for a one-year term, 2014.

Senior Member, Optical Society of America (OSA), 2014.

Fellow, American Physical Society (APS), 2013.

For her fundamental advancement of light sources, including the control of light and harmonic light generated from coherent electron beams and the development of high-power long wavelength sources.

George T. Abell Outstanding Mid-Career Faculty Award, College of Engineering, Colorado State University, 2013.

To recognize the accomplishments of a mid-career faculty member of the College. The faculty member must be a full time, tenured or tenure track member of the College Faculty serving at the Associate Professor level. The faculty member must be of good character and in good standing within the University. The award may recognize excellence and accomplishments in teaching, research and/or service. Faculty may receive this award once.

Elected as Executive Committee Member of the Department of Energy’s Fermi National Accelerator Laboratory User’s Organization for a two-year term representing the over 4000 users of the laboratory, 2013.

NATO Sensors and Electronics panel member for SET-193 nominated and endorsed by the Office of the Secretary of Defense, 2012 (other panels 2011 and 2008).

Fellow, SPIE (The International Society for Optics and Photonics), 2012.

For achievements in detection systems and sensors, and nonlinear harmonic emission in high-gain harmonic generation free-electron lasers.

Nominations Committee, American Physical Society's Division of Physics of Beams, 2011-2013.

Nomination of all of the potential officers and members-at-large for the executive committee that will run for election as well as all other members for the Publications, Education and Outreach, Wilson Prize, Doctoral Dissertation Award, and Fellowship committees.

Letter of Commendation, Presented by the Chief of Naval Research, Rear Admiral Nevin Carr, July 2010. Citation:

For her superior performance and ongoing commitment to aligning Argonne National Laboratory's Department of Energy (DOE) programs with the Office of Naval Research (ONR) Directed Energy programs. During this period, Dr. Biedron has been supporting the Free Electron Laser (FEL) Innovative Naval Prototype (INP) program. She has provided valuable independent insight working with the Industry, Department of Energy, Department of Defense and Academic members of the INP teams. Her continued commitment to building international partnerships in areas related to Directed Energy have enabled the community in keeping abreast of the latest advances in international Science and Technology (S&T) efforts. Dr. Biedron's steadfast commitment, outstanding professionalism, personal initiative, and unwavering devotion to science and technology reflect great credit upon herself as well as Argonne National Laboratory.

Guest of Honor, Recruit Graduation, Great Lakes Naval Station, May 2008.

There is only one recruit training center in the United States. Individuals that have given significantly to the Navy and Marines are invited to perform this honor. The incumbent visits all of the training facilities, including barracks and technical training facilities; meets and discusses with the recruits; and meets with individual award winners after the ceremony. Dr. Biedron visited the graduation in 2007 to learn the procedures with the Secretary of the Navy (Winter) – the Guest of Honor; Assistant Secretary of the Navy for Research, Development and Acquisition (Etter); the PEO of Submarines (Hilarides), Ret. Navy Captain DeSandre; and Ret. Navy Commander Graber. Dr. Biedron was then invited in 2008 to be the Guest of Honor. She took this opportunity to bring the entire Navy's Free-Electron Laser research team with her to have them interact with and see the training of individuals who will be operating these said technical systems, with the goal of applying this feedback to the machine design, including controls and operational procedures.

Elected to the IEEE (Institute of Electrical and Electronics Engineers) ADCOM (Administrative Committee) for the Nuclear Plasma and Sciences Society, 2006-2011.

Senior Member, IEEE (Institute of Electrical and Electronics Engineers), 2003.

U.S. Particle Accelerator School Scholarship Award, Summer 1997, Winter 1998, Summer 1998, Winter 1999, Summer 1999, and Winter 2000.

Van der Velde Scholarship Recipient, Trinity Christian College, 1993.

Leadership Award presented by the Veterans of Foreign Wars, 1990.

Professional Organizations and Service

The International Society for Optics and Photonics (SPIE)

- ◆ *Member [2001-Present], **Fellow 2012***
- ◆ *Symposium Committee Member [2010-2013]*
- ◆ *Awards Committee [2003-2005] — this committee selects the recipient of the most elite SPIE award (Gold Award)*
- ◆ *Scholarship and Grant Awards Committee Member [2003-2004]*
- ◆ *Chair Scholarship and Grant Awards Committee Member [2005-2006] — responsible for the 260K USD budget. Instrumental in requesting and obtaining SPIE Board of Directors' approval in elevating the budget at the level of 30K USD per year for five years for a total of 410K USD*
- ◆ *Education Committee [2005-2007]*

The Institute of Electrical and Electronic Engineers (IEEE)

- ◆ *Member [1995-Present], **Senior Member 2003***
- ◆ *Recipient of the IEEE Nuclear and Plasma Sciences Society's (NPSS) Particle Accelerator Science and Technology Award in 2018.*
- ◆ *Committee Member, IEEE Nuclear & Plasma Sciences Society, Particle Accelerator Science and Technology (PAST) Award Committee (2019).*
- ◆ *Nominated and elected twice to serve as the Particle Accelerator Science and Technology Representative for the Administrative Committee of the Nuclear and Plasma Sciences Society (NPSS) [2006, 2007-2011]. Among other activities this society co-chairs the North American Particle Accelerator Conference (NA-PAC).*
- ◆ *IEEE USA R&D Policy Committee NPSS Liaison [2007-2015]*
- ◆ *Particle Accelerator Science and Technology Technical Committee Member [2006-Present]*
- ◆ *Particle Accelerator Science and Technology Membership Sub-Committee Chair [2014-Present]*
- ◆ *Particle Accelerator Science and Technology Nominations Sub-Committee Member [2014-Present]*
- ◆ *Secretary and Treasurer of the IEEE Magnetics/Nuclear and Plasma Sciences Chicago Chapter [1996-1998]*

American Physical Society (APS)

- ◆ *Member [1998-Present], **Fellow 2013***
- ◆ *Nominating committee member for the Division of Physics of Beams (2011-2013)*
- ◆ *Education, Outreach & Diversity Committee Member (2015-2019); Vice-Chair (1/15-12/15), Chair (1/16-12/16), Past-Chair (1/17-12/17)*

Optical Society of America (OSA)

- ◆ *Member [2000-Present], **Senior Member 2014***

Directed Energy Professional Society

- ◆ *Member [2003-Present]*

Italian Society of Optics and Photonics (SIOF)

- ◆ *Member [2013-Present]*

AAPT (American Association of Physics Teachers) Chicago Section and National

- ◆ *Member [1994-2003] Active in Chicago Section Meetings*

Experimental Aircraft Association (EAA)

- ◆ *Member [2002-Present]*

Women in Aviation International

- ◆ *Member [2002-Present]*

Aircraft Owners and Pilots Association

- ◆ *Member [2002-Present]*

Work and Consulting Experience

Research Professor, Department of Electrical and Computer Engineering, School of Engineering, University of New Mexico [August 2017-Present]

- ◆ *Conduct research in beam physics and engineering*
- ◆ *Serve as a PI in the area of particle accelerators, RF, lasers, artificial intelligence – develop relationships with sponsors, host visits, write proposals*
- ◆ *Affiliate Member, Center for Bright Beams, A National Science Foundation Science and Technology Center*
- ◆ *Mentor graduate, undergraduate, and high school students*
- ◆ *Secure and manage activities supported by external sponsors, including LANL, DOE, and SLAC National Accelerator Facility*
- ◆ *Serve as expert on review panels and for refereed journals*
- ◆ *Serve the community through volunteer efforts in professional societies; in 2018, hosted IEEE President James Jefferies at UNM and LANL*

Research Professor, Department of Mechanical Engineering, School of Engineering, University of New Mexico [September 2019-Present]

- ◆ *Courtesy appointment to educate students and share research and development ideas and results*

Affiliate Professor, Department of Environmental and Radiological Health Sciences, College of Veterinary Medicine and Department of Electrical and Computer Engineering,, College of Engineering, Colorado State University [August 2017-Present]

Associate Professor, Electrical and Computer Engineering, Colorado State University [February 2011-August 2017]
4.5 months supported by the Department (70% research, 20% instruction, advising, and mentoring, 10% outreach)

- ◆ *Conduct research in beam physics and engineering*
- ◆ *Provide systems engineering and oversight for a variety of projects and contracts*
- ◆ *Serve as PI in the area of directed energy – develop relationships with sponsors, host visits, write proposals*
- ◆ *Mentor graduate, undergraduate, and high school students*
- ◆ *Mentor post-doctoral researchers*
- ◆ *Secure and manage activities supported by external sponsors, including LANL, Fermilab, Kyma, the Office of Naval Research, the SLAC National Accelerator Facility, Lockheed Martin, the Boeing Company, and the Office of the Secretary of Defense’s High Energy Laser (HEL) Joint Technology Office (JTO)*
- ◆ *Build the research facility “Advanced Beam Laboratory” at the request of the previous Dean and the College of Engineering*
- ◆ *Established and currently run an internship program for undergraduates and high school students*
- ◆ *Develop a strategic plan for a directed energy institute*
- ◆ *Develop and execute accelerator and beam coursework; serving as guest lecturer for established courses*
- ◆ *Attract and implement the U.S. Particle Accelerator School at CSU (e.g., summer 2013 and summer 2016)*
- ◆ *Serve as expert on review panels and for refereed journals*
- ◆ *Serve the community through volunteer efforts in professional societies*

Guest/Joint Faculty Appointment in the Department of Environmental and Radiological Health Sciences, College of Veterinary Medicine, Colorado State University [July 2016-August 2017]

Visiting Professor, Faculty of Electrical Engineering, University of Ljubljana, Slovenia [November 2015 – Present]

- ◆ *Conduct research in microelectronics with students and faculty*

- ◆ *Participate in dissertation committees of students*
- ◆ *Give lectures when visiting*

Director and Physicist, Department of Defense Project Office, Argonne National Laboratory [December 2005-February 2011] and Associate Director, Argonne Accelerator Institute [September 2006-February 2011]

- ◆ *Led and managed joint science and technology initiatives and activities between Argonne and Department of Defense (DOD) Services and Agencies*
- ◆ *Assisted DOD sponsors in building relationships to connect U.S. and international science and technology*
- ◆ *Represented Argonne science in science and technology panels, reviews, and reports*
- ◆ *Reported directly to the Argonne Associate Laboratory Director and Laboratory Director*
- ◆ *Initiated, built, and nurtured new collaborations with agencies other than DOE in the United States, with industry, academia, and internationally; secured contracts with Boeing, Lockheed Martin, and General Atomics*
- ◆ *Participated in laboratory strategic planning process and execution*
- ◆ *Secured and managed an over 10M USD per annum budget for activities supported by external sponsors, including the Office of Naval Research, NAVAIR, NAVSEA, and the Office of the Secretary of Defense's High Energy Laser (HEL) Joint Technology Office (JTO)*
- ◆ *Pursued research in beam and laser source development and use*
- ◆ *Provided systems engineering support for sensor, detector, and accelerator systems*
- ◆ *Served as associate director for the Argonne Accelerator Institute, which seeks to leverage beam physics capabilities and infrastructure across the Argonne complex*
- ◆ *Designed and used analytical tools for detection, monitoring, and diagnostics*
- ◆ *Provided work direction for those involved with my projects (physicists, electrical engineers, mechanical engineers, chemists, environmental engineers, technicians, designers, administrative staff— both internal and external to Argonne), as well as Ph.D. students at the University of Maryland, College Park, Maryland, and Monash University, Victoria, Australia (40-80 people)*
- ◆ *Served as a member of the executive free-electron laser (FEL) Technology Area Working Group (TAWG) of the HEL JTO, which defines and develops the technology roadmap for the FEL*
- ◆ *Served on a NATO Sensors and Electronics Panel*
- ◆ *Pursued the following research in beam physics as well as soft-x-ray and hard x-ray science:*
 - ◆ *Developed and explored uses of high power mm-wave to Terahertz sources and high-brightness electron guns.*
 - ◆ *Enabled the ability to map out the radiation mode pattern for each harmonic anywhere along a FEL. This was added to our code MEDUSA as a diagnostic tool and to help future client-users in determining the quality of FEL light.*
 - ◆ *Led and managed, since 1998, the international FEL Exotica group to develop novel and extreme techniques to achieve the next-generation coherent light sources extending from the infrared to the hard x-ray wavelength regimes. FEL Exotica also focused on exotic uses of synchrotron radiation.*
 - ◆ *Investigated the following – multi-harmonic undulator devices in depth; the transverse radiation mode patterns in future systems through simulation; the possibility of creating a tunable seed source; the generation of high-peak-power long wavelengths (down to the mm range)*
 - ◆ *Performed x-ray fluorescence (XRF), x-ray absorption near-edge structure (XANES), and extended x-ray absorption fine structure (EXAFS) experiments with environmental samples at the GSE-CARS bending magnet beamline at the APS; these experiments were focused on the elimination of chemical warfare agent stockpiles. Collaborators included members of the following internal Argonne divisions: Accelerator Systems Division (ASD), Experimental Facilities Division (XFD), High-Energy Physics Division (HEP), Chemistry Division, Materials Science Division (MSD), Nuclear Engineering Division (NE), and Energy Systems (ES) Division. In addition, collaborated with various members of several external institutions, including: Science Applications International Corporation (SAIC), Deutsches Elektronen-Synchrotron (DESY) [Hamburg, Germany], Stanford Linear Accelerator Center (SLAC), Lawrence Berkeley National Laboratory (LBL), ENEA Frascati, Brookhaven National Laboratory (BNL), INFN Frascati, Colorado State University, University of California at Los Angeles (UCLA) Physics and*

Astronomy Department, Thomas Jefferson National Accelerator Facility (JLAB), Communications and Power Industries (CPI), STI-Optronics, Aculight Corporation, the Naval Research Laboratory (NRL), The University of Chicago (CARS), BESSY [Berlin, Germany], Los Alamos National Laboratory (LANL), Advanced Energy Systems (AES), University of Maryland, Naval Postgraduate School, Vanderbilt University, MAX-Laboratory, the Australian Synchrotron, and the University of Twente.

Technology Consultant [2002-Present]

- ◆ *Provide expert technology consulting in aviation, beam physics and engineering (and peripherals), and science and engineering management; examples of clients include Sincrotrone Trieste, U.S. Office of Naval Research, and EEI Power Electronics*
- ◆ *Develop applications of aircraft and design of aerial platforms using advanced controls and sensors*
- ◆ *Provide Department of Homeland Security's Customs and Border Patrol support for the modification of procedures related to aircraft tracking and stops*
- ◆ *Served as management and technical consultant for the 200M USD FERMI@Elettra Project at Sincrotrone Trieste; led and advised staff on solving technical challenges; provided project support and guidance*

University of Maryland, Visiting Researcher [2006-2010]

- ◆ *Department of Electrical and Computer Engineering, - Institute for Research in Electronics and Applied Physics – supervised one graduate student*

Monash University, Honorary Senior Research Fellow, Victoria, Australia [2007-2012]

- ◆ *School of Physics – supervised one graduate student*

Applied Physicist and Project Manager, Member of the Applied Science and Technology and National Security Associate Laboratory Directorship, Argonne National Laboratory [October 2003-December 2005]

- ◆ *Served as the National Security Section Lead for Laser and Beam Technologies*
- ◆ *Pursued research in beam and laser source development and use*
- ◆ *Designed and used analytical tools for monitoring and diagnosis*
- ◆ *Led, managed, and participated in a two-year, 2M USD project as part of the Laboratory's National Security (NS) initiative funded by the High-Energy Laser (HEL) Joint Technology Office (JTO). The project focused on the design of four new electron beam sources (two normal-conducting and two superconducting), the manufacture and cold testing of the two-normal conducting versions, analytical cathode investigations, collaboration with other active JTO-funded researchers, and outreach to educational institutions.*
- ◆ *Led, managed, and participated in a two-year, 1.3M USD project on the development of gallium nitride negative electron affinity cathodes funded through the Naval Sea Systems Command*
- ◆ *Served as a technical expert to the Office of Naval Research (ONR)*
- ◆ *Led, managed, and participated in the intra-laboratory collaboration on "The use of synchrotron radiation sources for homeland security," which sought to improve and use various wavelengths of sources, sub-mm and x-ray radiation, for homeland security applications. This was funded by the Laboratory Directed Research and Development (LDRD) Director's Competitive Grants (DCG) of ANL. Served as Primary Investigator for the duration of the project.*
- ◆ *Served as a collaboration member on the "Evaluation of Electronic Nose Technology for USDA Applications in Detecting Contraband Meat Products and Vegetation," funded by the U.S. Department of Agriculture*
- ◆ *Co-organized the Australian Synchrotron Research Internship Program with a colleague from the University of Chicago. This program, launched in 2004, provides funding for two individuals to come to Argonne National Laboratory for a three-month period to either work on particle accelerators or participate in synchrotron radiation research.*
- ◆ *Provided work direction for those involved with my projects (physicists, electrical engineers, mechanical engineers, chemists, environmental engineers, technicians, designers, administrative staff), as well a Ph.D. student at the University of Maryland; supervisor to a Department of Homeland Security student; supervisor to a Lund University student*

- ◆ *Served as a member of the executive MegaWatt FEL Panel tasked by the U.S. Navy with defining the roadmap, writing the request for information to industry, and providing technical readiness levels for the MW-class laser for directed energy*
- ◆ *Served as a member of the executive Technology Area Working Group (TAWG) of the HEL JTO that defines and develops the technology roadmap for the FEL*
- ◆ *Served as a technology auditor for the BESSY (der Berliner Elektronenspeicherring-Gesellschaft für Synchrotronstrahlung mbH) FEL project, Berlin, Germany. Performed the necessary external expert validation of the FEL system parameters and radiation output in preparation for the then-upcoming Ministry of Science hearing to decide the project's fate and funding. Contract of 60k USD.*
- ◆ *Assisted the Accelerator Physics Group at MAX-Laboratory at Lund University. Primarily focused on the calculations and specifications for the injector upgrade as well as plans for the future. This included activities on the following: rf thermionic gun design at 3-GHz; linacs, booster, storage rings, and transfer line design; diagnostics design; and FEL design in the IR, VIS, and VUV/soft-x-ray regime.*
- ◆ *Pursued research in beam physics and x-ray science. Collaborations and activities are outlined in the most recent Argonne position description above.*

Physicist, Member of the Administration of the Experimental Facilities Division at the Advanced Photon Source, Argonne National Laboratory [April 2002-October 2003]

- ◆ *Served as the scientific communications coordinator*
- ◆ *Coordinated technology transfer*
- ◆ *Recruited new and innovative users*
- ◆ *Performed outreach to chambers of commerce and involvement at higher educational institutions*
- ◆ *Pursued research in beam physics and x-ray science. Collaborations and activities outlined in the position description above are identical to those listed and performed in this position.*

Member of the Accelerator Physics Group, MAX-Laboratory [1997-2003]

- ◆ *Pursued research in beam physics and x-ray science*
- ◆ *Developed new light sources*
- ◆ *Served as a member of the Accelerator Physics Group at MAX-Laboratory at Lund University, primarily focused on the calculations and specifications for the injector upgrade as well as plans for the future. This included activities on the following – rf thermionic gun design at 3-GHz; linacs, booster, storage rings, and transfer line design; diagnostics design; and FEL design in the IR, VIS, and VUV/soft-x-ray regime.*

Chief of Operations of Accelerator Research and Development and Member of the Main Control Room Operations Group at the Advanced Photon Source, Accelerator Operations Division, Argonne National Laboratory [January 1998-April 2002]

- ◆ *Served as the scientific liaison between the Operations Group and the Accelerator and FEL Physics Group. This served to better educate the members of the Accelerator and FEL Physics Groups on practical accelerator operation as well as educate the members of the Operations Group on accelerator physics.*
- ◆ *Maintained the Electron Linear Accelerator for Education (ELLE)*
- ◆ *Collaborated in the BNL/ANL (Brookhaven National Laboratory/Argonne National Laboratory) SASE/Seeded/HGHG FEL (Self-Amplified Spontaneous Emission/Seeded/High-Gain Harmonic Generation Free Electron Laser) at 5 microns experiment at the Accelerator Test Facility at BNL*
- ◆ *Participated in the organization, development, and commissioning of the low-energy undulator test line (LEUTL), otherwise known as the APS SASE FEL, which included theory; simulations; participation in studies shifts; and maintenance on an rf photocathode gun and drive laser, two rf thermionic guns, and various diagnostics. Educated the operators on this system, since their assistance and*

cooperation was required in the LEUTL commissioning and operation. Secured operational readiness from DOE for transition to operations.

- ◆ Collaborated with various members of the following internal divisions on a variety of internally and externally funded research: Accelerator Systems Division (ASD), Experimental Facilities Division (XFD), High-Energy Physics Division (HEP), Argonne Glass Shop in the Chemistry Division, Chemistry Division, and Materials Science Division (MSD)
- ◆ Initiated, lead, and managed an international think-tank to develop the next-generation light source (FEL Exotica)
- ◆ Developed several novel techniques to enhance next-generation light sources
- ◆ Collaborated with various members of the following external institutions on a variety of research: Science Applications International Corporation (SAIC), Deutsches Elektronen-Synchrotron (DESY) [Hamburg, Germany], Stanford Linear Accelerator Center (SLAC), Lawrence Berkeley Laboratory (LBL), ENEA Frascati and Bologna - Divisione Fisica Applicata, Brookhaven National Laboratory (BNL), Accelerator Test Facility (BNL), Colorado State University, Femtochrome Research [Berkeley, California], Boeing, University of California at Los Angeles (UCLA) Physics and Astronomy Department, DANFYSIK, Advent Associates, Clinton Electronics Corporation, EXPO 2000 (Held in Germany), Glassman High Voltage, Insulator Seal, Inc. (ISI), John Rigoni (Electron Gun Engineer and Developer), MDC Vacuum Systems, Sci-Comp, Televac, Thomas Jefferson National Accelerator Facility, W.A. Rowe Consultancy, and Zenith Electronics Corporation
- ◆ Served as project leader and manager for the Electron Linear Accelerator for Education Two (ELLETwo) at EXPO2000 Germany – Tesla Test Facility Hall, DESY. (This included the same collaborations as listed for ELLE in the following section.)
- ◆ Assisted in the development of the USPAS/IU course “Accelerator Fundamentals” in 2000.

Member of the Accelerator Physics Group at the Advanced Photon Source (APS), Accelerator Systems Division, Argonne National Laboratory [October 1995-January 1998]

- ◆ Assisted the accelerator physics team in support of APS operations; provided technical support during commissioning periods and developed methods for enhancing accelerator operations
- ◆ Served as project leader and manager for the development of an accelerator-based educational exhibit, which included a low-energy linear accelerator, a laser exhibit, actual beamline components, and various explanation boards; supervised the development of this educational exhibit. Formed internal partnerships with engineers and technicians, and also stimulated external collaborations with Zenith Electronics Corporation, the Argonne Glass Shop, Glassman High-Voltage, Advent Associates, MDC Vacuum Systems, Televac, W. A. Rowe Consultancy, John Rigoni, Sci-Comp, and Clinton Electronics Corporation.
- ◆ Assisted in the development of the USPAS/IU/MIT course “Accelerator Fundamentals” held in June, 1997, and of a multi-tiered accelerator physics course held at the APS in 1997-98
- ◆ Developed methods to improve the first-turn injection into the APS booster synchrotron to maximize operational readiness for users
- ◆ Designed and planned the photocathode rf gun portion of the low-energy undulator test line

Physics Instructor at Columbia College, Chicago [October 1997-April 1998]

- ◆ Taught the course “The Physics of Acoustics” to sound engineers and other interested individuals
- ◆ Developed the course “The Physics of Motion” based on much of my previous work performed in 1994-95

Interactive Designer, Illinois Institute of Technology (IIT), Physics Department [August 1995-August 1997]

Composed questions for an in-class interactive question/response system with a Nobel Laureate and a world-renowned high-energy physics professor. Wrote, directed, and participated in the creation of physics video demonstrations, which also were converted for use with personal computers.

Database Designer, Fermi National Accelerator Laboratory (through IIT) [October 1995-May 1996]

Used Oracle to design a run-time logbook and database for experimental data on 35,000 data tapes (Experiment 871)

Interactive Designer, Mediagenic Software Solutions, Inc. [March 1995-October 1996]

Designed and developed entire content and instructional media for an interactive physics multimedia title, intended for commercial release. Worked with developers and graphic designers to enhance appeal of the product for its target audience. Developed some of the first web sites in the Chicagoland area. Helped to build and structure the company near Chicago and its cousin company in India.

Scientific Associate (Analytical Chemistry), Energy Systems Division, Argonne National Laboratory [November 1993-June 1996].

Grants, Contracts, Funding, and Recent Donations or Transfers

University of New Mexico

Contracts and Grants as PI

(01/2019-12/2019) “Support to Ion Linac Systems (ILS), Inc.,” Dr. Sandra Biedron, PI, \$15k total.

(12/2018-11/2020) “Support of Instrumentation and RF Developments at SLAC,” Dr. Sandra Biedron, PI, \$250k total.

(10/2018-09/2021) “Research in Advanced Artificial Intelligence Techniques for Modern Accelerator Control,” Dr. Sandra Biedron, PI, \$600k total.

(6/2018-11/2023) “Accelerator Science and Technology Graduate and Undergraduate Research Program for Los Alamos National Laboratory,” Dr. Sandra Biedron, PI, \$70k per year.

Colorado State University

Contracts and Grants as PI

(05/2017-05/2020) “Accelerator Science and Technology Graduate and Undergraduate Research Program for Los Alamos National Laboratory,” Dr. Sandra Biedron, PI, LANL, \$260k.

(12/2016-11/2018) “Support of Instrumentation and RF Developments at SLAC,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, SLAC, \$260k.

(12/2016-03/2017) “RFQ water system activities for FERMILAB – PXIE Follow-On Tasks,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Fermilab, \$33k.

(07/2016-04/2017) “Detailed Design and Beam Dynamics of a High-Average Current SRF Electron Source,” Dr. Sandra Biedron, PI, Universities Research Association, \$10k.

(07/2016-04/2017) “Improved Magnetic Field Mapping of Horns for Enhanced Predictions of Neutrino Production for Next Generation FNAL Long Baseline Neutrino Facility (LBNF),” Dr. Sandra Biedron, PI, Universities Research Association, \$10k.

(12/2015-01/2016) “Analysis of FEL Laser Design,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Lockheed Martin, \$25k.

(05/2015-06/2016) “Detailed Design and Beam Dynamics of a High-Average Current SRF Electron Source,” Dr. Sandra Biedron, PI, Universities Research Association, \$15k.

(05/2015-06/2016) “Improved Magnetic Field Mapping of Horns for Enhanced Predictions of Neutrino Production for Next Generation FNAL Long Baseline Neutrino Facility (LBNF),” Dr. Sandra Biedron, PI, Universities Research Association, \$15k.

(05/2015-05/2016) “Pulsed-Wire Magnet Measurement Pre-Production System for Kyma,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Kyma, \$45k.

(1/2015-9/2016) “LLRF Activities for FERMILAB,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Fermilab, \$188k.

(01/2015-05/2016) “RFQ Water System Activities for FERMILAB,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Fermi National Accelerator Laboratory, \$178k.

(11/2013-12/2013) “Calculations for Lockheed Martin,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Lockheed Martin, \$20k.

(09/2013-12/2014) “Colorado State University Support of SLAC,” Dr. Sandra Biedron, PI, SLAC National Accelerator Laboratory, \$44k.

(09/2012-12/2015) “Electro-Optical Sampling System for a High-Power ERL-Driven FEL,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, MRI of the Office of the Secretary of Defense’s High Energy Laser Joint Technology Office, \$1.05M.

(07/2012-09/2014) “Colorado State University Directed Energy (DE) and Free-Electron Laser (FEL) Science and Technology for Naval Air Warfare and Weapons (CODE 35),” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, The Office of Naval Research, \$300k.

(07/2011-09/2014) “Colorado State University Directed Energy (DE) and Free-Electron Laser (FEL) Science and Technology for Naval Air Warfare and Weapons (CODE 35),” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, The Office of Naval Research, \$907k.

(02/2011-02/2012) “Colorado State University Support of Boeing for the Innovative Naval Prototype: 100-kW Free-Electron Laser Demonstration,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, The Boeing Company, \$520k.

(02/2011-01/2012) “Colorado State University Support of Lockheed Martin for Space Debris Mitigation and Terahertz (THz) studies,” Dr. Sandra Biedron, PI, Dr. Stephen Milton, co-PI, Lockheed Martin, \$55k.

Contracts and Grants as Co-PI

(10/2016-09/2017) “Design of a MW-class compact SRF accelerator for Energy and Environmental applications,” Dr. Stephen Milton, PI, Sandra Biedron co-PI, Fermilab (DOE Accelerator Stewardship, CSU a sub-awardee), \$15k.

(06/2016-05/2019) “Innovation Solutions for Scaling High Energy Ultrafast Lasers to Multi-Kilowatt Average Power for Compact Accelerators and Applications,” Dr. Jorge Rocca, PI, Dr. Sandra G. Biedron, co-PI, Dr. Stephen Milton, co-PI, Department of Energy (Accelerator Stewardship), \$1.2M.

(06/2014-12/2015) “Support of ASML for the Conceptual Design of Coherent Radiators,” Dr. Henry Freund, PI, Dr. Stephen V Milton, co-PI, Dr. Sandra G. Biedron, co-PI, ASML, \$454k.

(12/2013-09/2014) “X-band-based Compact Light Sources,” Dr. Stephen Milton, PI, Dr. Sandra Biedron, co-PI, SLAC National Laboratory, \$50k.

(11/2012-05/2014) “Laser Damage of Optical Coatings up to 2.5 microns for MW-class Free Electron Lasers,” Dr. Carmen Menoni, PI, Dr. Sandra Biedron, co-PI, Dr. Jorge Rocca, co-PI, Office of the Secretary of Defense’s (OSD) High Energy Laser (HEL) Joint Technology Office (JTO), contract issued by Air Force Research Laboratory (contract agent for the OSD HEL JTO listed as DOD-USAF-Air Force), \$438k.

(03/2012-03/2013) “X-band-based Compact Light Sources,” Dr. Stephen Milton, PI, Dr. Sandra Biedron, co-PI, SLAC National Laboratory, \$100k.

Consulting (Recent)

Contracts and Funding as PI

(2018) “Technical Support,” EEI Power Electronics, \$10k.

(2015) “Technical Support for a Guyed LF (radio) tower,” Global One Engineering, \$30k.

(2012-2014) “Technical Support,” S. Biedron and S. Milton, Office of Naval Research, \$254k.

(2007-2011) “Technical and Management Advisor for the FERMI@Elettra Free-Electron Laser,” S. Biedron, Sincrotrone Trieste, \$680k.

Argonne National Laboratory*Contracts and Funding as PI*

(2008-2011) Basic Research to Support ONR, S. Biedron, Office of Naval Research, \$1.812M.

(2008-2011) Support of the Innovative Naval Prototype FEL, S. Biedron, The Boeing Company, \$350k.

(2008) Support of the Innovative Naval Prototype FEL Proposal Preparation, S. Biedron, General Atomics, \$35k.

(2007-2009) Field Emission Cathodes for FELs, S. Biedron, High-Energy Laser Joint Technology Office, \$522.5k.

(2005-2007) Beam Physics Research, S. Biedron, Office of Naval Research, \$2.167M.

(2005-2007) Negative Electron Affinity Photocathodes, S. Biedron, Argonne National Laboratory, NAVSEA, \$845.8k.

(2004-2006) Investigation of Normal and Superconducting RF Guns, S. Biedron, Air Force Research Laboratory, High-Energy Laser Joint Technology Office, \$1.983.6M.

(2002-2005) Laboratory Director's Research Directive funds for Homeland Security, S. Biedron, Argonne National Laboratory, \$1.5M.

(1998-2001) Laboratory Director's Research Directive funds for Free-Electron Lasers, S. Biedron, Argonne National Laboratory, \$1.0M.

(1994) Travel Grant, S. Biedron, European Particle Accelerator Conference, \$1500.

Contracts and Funding as a co-PI

(2005) FEL assessment, H.P. Freund, PI, (SAIC) and S. Biedron, co-PI, BESSY, Germany, \$60k.

(2002-2004) Detection Techniques, J. Schneider, PI, DHS-USDA, \$2M.

(1995-2002) Laboratory Director's Research Directive funds for Fourth Generation Light Sources, S. Milton, PI, Argonne National Laboratory, ~\$15M.

Contracts and Funding as a staff member (participant)

1995-2003 Core funding part of a congressional line-item from DOE, ~\$120M per year (different each year), for the operation and development of the Advanced Photon Source synchrotron radiation Office of Science facility.

1992-1995 AMTEX project, (1995), ~\$2M; U.S. Army projects, ~\$3M.

Donations and Transfers to Element Aero

University of Twente Particle Accelerator and peripherals, estimated replacement cost \$12M.

Coherent Laser and peripherals donated by the Boeing Company, replacement cost \$1.6M.

Copper prototype electron guns, Argonne National Laboratory transfer, replacement cost \$150k.

Various measurement equipment for the 300-micron-wavelength regime, Argonne National Laboratory transfer, replacement cost \$60k.

Electron Linear Accelerator for Education, Argonne National Laboratory, replacement cost \$50k.

Colutron (Lars Wahlin, Owner), 60 degree bending magnet and power supply, replacement cost \$15k.

Books – Student Names are underlined (students of my own or those I helped mentor)

As Editor (Conference Proceedings)

Advances in X-ray Free-Electron Lasers Instrumentation III, Sandra G. Biedron (ed.), Proc. SPIE 9512 (2015).

As Co-editor (Conference Proceedings)

Fourth Generation X-Ray Sources and Optics III, Roman O. Tatchyn, Sandra G. Biedron, Wolfgang Eberhardt (eds.), Proc. SPIE 5917 (2005).

Fourth Generation X-Ray Sources and Optics II, Sandra G. Biedron, Wolfgang Eberhardt, Tetsuya Ishikawa, Roman O. Tatchyn (eds.), Proc. SPIE 5534 (2004).

As Author (Chapter)

S.G. Biedron, G. Dattoli, E. Di Palma, J. Einstein, S.V. Milton, V. Petrillo, J.V. Rau, E. Sabia, I.P. Spassovsky, “A compact coherent system architecture,” in Advances in Laboratory-based X-Ray Sources, Optics, and Applications V, Ali M. Khounsary, Gert E. van Dorssen (eds.), Proc. SPIE 996402 (2016).

S.G. Biedron, A.L. Edelen, S.V. Milton, “Advanced controls for light sources,” in Advances in Laboratory-based X-Ray Sources, Optics, and Applications V, Ali M. Khounsary, Gert E. van Dorssen (eds.), Proc. SPIE 996404 (2016).

S.V. Milton, J. Einstein, S.G. Biedron, “Simulations of laser undulators,” in Advances in Laboratory-based X-Ray Sources, Optics, and Applications V, Ali M. Khounsary, Gert E. van Dorssen (eds.), Proc. SPIE 996406 (2016).

S.G. Biedron, G. Dattoli, S.V. Milton, L. Ottaviani, S. Pagnutti, V. Petrillo, E. Sabia, P.J.M. van der Slot, “FEL effects occurring in the deeply saturated regime,” in Advances in Laboratory-based X-Ray Sources, Optics, and Applications V, Ali M. Khounsary, Gert E. van Dorssen (eds.), Proc. SPIE 996418 (2016).

R. Beigang, S.G. Biedron, S. Dyjak, F. Ellrich, M.W. Haakestad, D. Hübsch, T. Kartaloglu, E. Ozbay, F. Ospald, N. Palka, U. Puc, E. Czerwińska, A.B. Sahin, A. Sešek, J. Trontelj, A. Švigelj, H. Altan, A.D. van Rheenen, M. Walczakowski, “Comparison of terahertz technologies for detection and identification of explosives,” in Terahertz Physics, Devices, and Systems VIII: Advanced Applications in Industry and Defense, Mehdi F. Anwar, Thomas W. Crowe, Tariq Manzur (eds.), Proc. SPIE 9102 (2014) 91020C. **CITED BY 24**

S.G. Biedron, R. Bartolini, F. Ciocci, G. Dattoli, W.M. Fawley, G. Felici, H.P. Freund, H.-D. Nuhn, P.L. Ottaviani, A. Renieri, “Exotic harmonic generation schemes in high-gain free-electron lasers,” in LASE 2002, Laser and Beam Control Technologies, Santanu Basu, James F. Riker (eds.), Proc. SPIE 4632 (2002) 50.

S.G. Biedron, H.P. Freund, and S.V. Milton, “3D FEL code for the simulation of a high-gain harmonic generation experiment,” in Free-Electron Laser Challenges II, Harold E. Bennett, David H. Dowell (eds.), Proc. SPIE 3614 (1999) 96. **CITED BY 17**

S.V. Milton et al., “The FEL development at the Advanced Photon Source,” in Free-Electron Laser Challenges II, Harold E. Bennett, David H. Dowell (eds.), Proc. SPIE 3614 (1999) 86. **CITED BY 15**

As Author (Book)

G. Dattoli, A. Petralia (ENEA), V. Petrillo (INFN Milano and University of Milano), S. Biedron and S. Milton (Colorado State University), “Elementi di Meccanica Quantistica,” ENEA ISSN/0393-3016, 2014.

*Journal Articles – Student Names are underlined (students of my own or those I helped mentor)*In Preparation

- [1] A. Edelen, S. Biedron, S. Milton, “Convolutional neural networks as applied to image-based analysis and control of laser and electron beams,” manuscript in preparation for Physical Review Accelerators and Beams.
- [2] A. Edelen, S. Biedron, S. Milton, “Neural network based trajectory control of the Jefferson Laboratory energy recovery linac,” manuscript in preparation for Physical Review Accelerators and Beams.
- [3] N. Sipahi, S. Biedron, and S. Milton, “Design of a klystron-inspired CW terahertz source,” to be submitted to Physical Review Accelerators and Beams.
- [4] S.G. Biedron, S.V. Milton, S. Schaffer, M. Burgo, T. Bolin, S. Gammino, C. Gigli, S. Passarello, “Limiting environmental and human exposure limits in vertical structures,” manuscript in preparation for Process Safety and Environmental Protection.

Submitted

- [1] T. Sipahi, S.V. Milton, and S.G. Biedron, “Theory and design of collinear X-band energy booster for a compact free-electron laser system,” submitted to Physical Review Accelerators and Beams.

Published

- [1] N. Sipahi, S.G. Biedron, I. Gonin, R. Kephart, T. Khabiboulline, S.V. Milton, N. Solyak, V. Yakovlev, 2020, “Design of a compact integrated high-average power superconducting radio-frequency (SRF) electron beam source,” Nuclear Instruments and Methods in Physics Research A 951, 162952, doi: <https://doi.org/10.1016/j.nima.2019.162952>.
- [2] Y. Tao, S.J. Goh, H.M.J. Bastiaens, P.J.M. van der Slot, S.G. Biedron, S.V. Milton, K.-J. Boller, 2017, “Cluster size dependence of high-order harmonic generation,” New Journal of Physics 19, 083017, doi 10.1088/1367-2630/aa8029.
- [3] Y. Tao, S.J. Goh, H.M.J. Bastiaens, P.J.M. van der Slot, S.G. Biedron, S.V. Milton, K.-J. Boller, 2017, “Temporal model for quasi-phase matching in high-order harmonic generation,” Optics Express 25(4), 3621-3638. **CITED BY 7.**
- [4] J.P. Edelen, D. Bowring, B.E. Chase, and J. Steimel (FNAL), A.L. Edelen, S.G. Biedron, and S.V. Milton (CSU), 2017, “First Principles Modeling of RFQ Cooling Systems and Resonant Frequency Responses for Fermilab’s PIP-II Injector Test,” IEEE Transactions on Nuclear Science 64(2), 800-808.
- [5] P.L. Ottaviani, S. Pagnutti, G. Dattoli, E. Sabia, V. Petrillo, P.J.M. van der Slot, S. Biedron, S. Milton, 2016, “Deep saturated Free Electron Laser oscillators and frozen spikes,” Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 834, 108-117.
- [6] A.L. Edelen, S.G. Biedron, B.E. Chase, D. Edstrom, S.V. Milton, P. Stabile, 2016, “Neural Networks for Modeling and Control of Particle Accelerators,” IEEE Transactions on Nuclear Science 63(2), 878-897. (Invited paper) **CITED BY 32**
- [7] S. J. Goh, Y. Tao, P. J. M. van der Slot, H. J. M. Bastiaens, J. Herek, S. G. Biedron, S. V. Milton, and K.-J. Boller, 2016, “Spectral control of high-harmonic generation via drive laser pulse shaping in a wide-diameter capillary,” Optics Express 24(2), 1604-1615. **CITED BY 3**
- [8] S. J. Goh, Y. Tao, P. J. M. van der Slot, H. J. M. Bastiaens, J. Herek, S. G. Biedron, M. B. Danailov, S. V. Milton, and K.-J. Boller, 2015, “Single-shot fluctuations in waveguided high-harmonic generation,” Optics Express 23(19), 24888-24902, doi: 10.1364/OE.23.024888. **CITED BY 3**

- [9] G. Dattoli, E. Di Palma, V. Petrillo, J.V. Rau, E. Sabia, I. Spassovsky, S.G. Biedron, J. Einstein, S.V. Milton, 2015, “Pathway to a Compact SASE FEL Device,” Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 798, 144-151.
- [10] J.P. Edelen, S.G. Biedron, J.R. Harris, J.W. Lewellen, and S.V. Milton, 2015, “Theory and Simulation of Back-bombardment in Single-Cell Thermionic-Cathode Electron Guns,” Physical Review Special Topics–Accelerators and Beams 18, 043402-1-5. **CITED BY 9**
- [11] C. Hall, S. Biedron, A. Edelen, S. Milton, S. Benson, D. Douglas, R. Li, and C. Tennant, and B. Carlsten, 2015, “Measurement and simulation of the impact of coherent synchrotron radiation on the Jefferson Laboratory energy recovery linac electron beam,” Physical Review Special Topics–Accelerators and Beams 18, 030706. **CITED BY 10**
- [12] P. Craievich, M. Petronio, S.G. Biedron, D. Castronovo, M. Dal Forno, S. Di Mitri, N. Faure, D. La Civita, G. Penco, L. Rumiz, L. Sturari, R. Vescovo, and D. Wang, 2015, “Implementation of radio-frequency deflecting devices for comprehensive high-energy electron beam diagnosis,” IEEE Transactions on Nuclear Science 62(1), 210-220. **CITED BY 21**
- [13] S. Spampinati, E. Allaria, L. Badano, S. Bassanese, S. Biedron, D. Castronovo, P. Craievich, M. B. Danailov, A. Demidovich, G. De Ninno, S. Di Mitri, B. Diviacco, M. Dal Forno, E. Ferrari, W. M. Fawley, L. Fröhlich, G. Gaio, L. Giannessi, G. Penco, C. Serpico, C. Spezzani, M. Trovò, M. Veronese, S. V. Milton, and M. Svandrlik, 2014, “Laser heater commissioning at an externally seeded free-electron laser,” Physical Review Special Topics–Accelerators and Beams 17, 120705. **CITED BY 41**
- [14] J.P. Edelen, S.G. Biedron, J.R. Harris, J.W. Lewellen, and S.V. Milton, 2014, “Electron back-bombardment and mitigation in a short gap, thermionic cathode RF gun,” IEEE Transactions on Nuclear Science 61(2), 830-836. **CITED BY 12**
- [15] M. Ferrario, D. Alesini, M. Alessandroni, M.P. Anania, S. Andreas, M. Angelone, A. Arcovito, F. Arnesano, M. Artioli, L. Avaldia, D. Babusci, A. Bacci, A. Balerna, S. Bartalucci, R. Bedogni, M. Bellaveglia, F. Bencivenga, M. Benfatto, S. Biedron, V. Bocci, M. Bolognesi, P. Bolognesi, R. Bonia, R. Bonifacio, F. Boscherinia, M. Boscolo, F. Bossi, F. Broggi, B. Buonomo, V. Calo, D. Catone, M. Capogni, M. Capone, K. Cassou, M. Castellano, A. Castoldi, L. Catani, G. Cavoto, N. Cherubini, G. Chirico, M. Cestelli-Guidi, E. Chiadroni, V. Chiarella, A. Cianchi, M. Cianci, R. Cimino, F. Ciocci, A. Clozza, M. Collini, G. Colo, A. Compagno, G. Contini, M. Coreno, R. Cucini, C. Curceanu, F. Curciarello, S. Dabagov, E. Dainese, I. Davoli, G. Dattoli, L. De Caro, P. De Felice, V. De Leo, S. Dell Agnello, S. Della Longa, G. Delle Monache, M. De Spirito, A. Di Cicco, C. Di Donato, D. Di Gioacchino, D. Di Giovenale, E. Di Palma, G. Di Pirro, A. Dodaro, A. Doria, U. Dosselli, A. Drago, K. Dupraz, R. Escribano, A. Esposito, R. Faccini, A. Ferrara, A. Filabozzi, D. Filippetto, F. Fioria, O. Frasciello, L. Fulgentini, G.P. Gallerano, A. Gallo, M. Gambaccini, C. Gatti, G. Gatti, P. Gauzzi, A. Ghigo, G. Ghiringhelli, L. Giannessi, G. Giardino, C. Giannini, F. Giorgianni, E. Giovenale, D. Giulietti, L. Gizzi, C. Guaraldo, C. Guazzoni, R. Gunnella, K. Hatada, M. Iannone, S. Ivashyn, F. Jegerlehner, P.O. Keefe, W. Kluge, A. Kupsc, L. Labate, P. Levi Sandri, V. Lombardi, P. Londrillo, S. Loreti, A. Lorusso, M. Losacco, A. Lukin, S. Lupi, A. Macchi, S. Magazù, G. Mandaglio, A. Marcelli, G. Margutti, C. Mariani, P. Mariani, G. Marzo, C. Masciovecchio, P. Masjuan, M. Mattioli, G. Mazzitelli, N.P. Merenkov, P. Michelato, F. Migliardo, M. Migliorati, C. Milardi, E. Milotti, S. Milton, V. Minicozzi, S. Mobilio, S. Morante, D. Moricciani, A. Mostacci, V. Muccifora, F. Murtas, P. Musumeci, F. Nguyen, A. Orecchini, G. Organtini, P.L. Ottaviani, C. Pace, E. Pace, M. Paci, C. Pagani, S. Pagnutti, V. Palmieri, L. Palumbo, G.C. Panaccione, C.F. Papadopoulos, M. Papi, M. Passera, L. Pasquini, M. Pedio, A. Perrone, A. Petralia, M. Petrarca, C. Petrillo, V. Petrillo, P. Pierini, A. Pietropaolo, M. Pillon, A.D. Polosa, R. Pompili, J. Portoles, T. Prospero, C. Quresima, L. Quintieri, J.V. Rau, M. Reconditi, A. Ricci, R. Ricci, G. Ricciardi, G. Ricco, M. Ripani, E. Ripiccini, S. Romeo, C. Ronsivalle, N. Rosato, J.B. Rosenzweig, A.A. Rossi, A.R. Rossi, F. Rossi, G. Rossi, D. Russo, A. Sabatucci, E. Sabia, F. Sacchetti,

- S. Salducco, F. Sannibale, G. Sarri, T. Scopigno, J. Sekutowicz, L. Serafini, D. Sertore, O. Shekhovtsova, I. Spassovsky, T. Spadaro, B. Spataro, F. Spinozzi, A. Stecchi, F. Stellato, V. Surrenti, A. Tenore, A. Torre, L. Trentadue, S. Turchini, C. Vaccarezza, A. Vacchi, P. Valente, G. Venanzoni, S. Vescovi, F. Villa, G. Zanotti, N. Zema, M. Zobov, F. Zomer, 2014, "IRIDE: Interdisciplinary research infrastructure based on dual electron linacs and lasers," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 740(11), 138-146.
- [16] E. Allaria, R. Appio, L. Badano, W.A. Barletta, S. Bassanese, S.G. Biedron, A. Borga, E. Busetto, D. Castronovo, P. Cinquegrana, S. Cleva, D. Cocco, M. Cornacchia, P. Craievich, I. Cudin, G. D'Auria, M. Dal Forno, M.B. Danailov, R. De Monte, G. De Ninno, P. Delgiusto, A. Demidovich, S. Di Mitri, B. Diviacco, A. Fabris, R. Fabris, W. Fawley, M. Ferianis, E. Ferrari, S. Ferry, L. Froehlich, P. Furlan, G. Gaio, F. Gelmetti, L. Giannessi, M. Giannini, R. Gobessi, R. Ivanov, E. Karantzoulis, M. Lonza, A. Lutman, B. Mahieu, M. Milloch, S.V. Milton, M. Musardo, I. Nikolov, S. Noe, F. Parmigiani, G. Penco, M. Petronio, L. Pivetta, M. Predonzani, F. Rossi, L. Rumiz, A. Salom, C. Scafuri, C. Serpico, P. Sigalotti, S. Spampinati, C. Spezzani, M. Svandrlik, C. Svetina, S. Tazzari, M. Trovo, R. Umer, A. Vascotto, M. Veronese, R. Visintini, M. Zaccaria, D. Zangrando and M. Zangrando, 2012, "Highly Coherent and Stable Pulses from the FERMI Seeded Free-Electron Laser in the Extreme Ultraviolet," *Nature Photonics* 6, 699. **CITED BY 769**
- [17] S.G. Biedron and S.V. Milton, 2011, "Next-generation Light Sources in 2010," *IEEE Photonics Journal* 3, 249-254. (Invited paper)
- [18] E. Meier, S.G. Biedron, G. LeBlanc, M.J. Morgan, 2011, "Development of a Novel Optimization Tool for Electron Linacs Inspired by Artificial Intelligence Techniques in Video Games," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 632, 1-6. **CITED BY 8**
- [19] E. Meier, S.G. Biedron, G. LeBlanc, M.J. Morgan, J. Wu, 2009, "Electron Beam Energy and Bunch Length Feed Forward Control Studies Using an Artificial Neural Network at the Linac Coherent Light Source," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 610, 629-635. **CITED BY 7**
- [20] E. Meier, M. Morgan, S.G. Biedron, G. LeBlanc, J. Wu, 2009, "Development of a Combined Feed Forward-Feedback System for an Electron Linac," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 609, 79-88. **CITED BY 11**
- [21] S.G. Biedron, J.W. Lewellen, S.V. Milton, N.S. Gopalsami, J. Schneider, L. Skubal, Y. Li, M. Virgo, G.P. Gallerano, A. Doria, E. Giovenale, G. Messina, I. Panov Spassovsky, 2007, "Compact, High-Power Electron Beam Based Terahertz Sources," *Proceedings of the IEEE* 95(8), 1666-1678. (Invited Paper) **CITED BY 29**
- [22] L.R. Skubal, S.G. Biedron, M. Newville, J.F. Schneider, S.V. Milton, P. Pianetta, H.J. O'Neill, 2005, "Mercury Transformations in Chemical Agent Simulant as Characterized by XAFS," *Talanta (The International Journal of Pure and Applied Analytical Chemistry)* 67, 730-735.
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- [2] Co-author: Technology Perspectives Factual Document for the Basic Research Needs Workshop on Compact Accelerators for Security and Medicine, May 6-8, 2019, Department of Energy Report for the Office of High-Energy Physics, to be released.
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Patent

United States Patent, “Modular Approach to Next-Generation, Short-Wavelength, Laser-Like Light Sources,” 09/916,458, submitted 31 July 2001, publication number 2003/0026300A1, Patent Number 6,831,933.

Patent Applications

United States Provisional Patent Application 62/302,175, “Containment Shroud System,” filed 2 March 2016.

United States Non-provisional patent application 15/448,574, “Containment Shroud System,” filed 2 March 2017.

PCT/US17/20547, “Containment Shroud System,” filed 2 March 2017.

Invention Disclosures to Argonne National Laboratory and the Department of Energy

S.G. Biedron, S.V. Milton, and H.P. Freund, “Nonlinear Harmonic in Free Electron Lasers,” 2001.

S.G. Biedron, S.V. Milton, and H.P. Freund, “Modular Approach to the Next-Generation Light Source,” 2001.

S.G. Biedron, R. Bartolini, F. Ciocci, G. Dattoli, G. Felici, H.P. Freund, S. Gottschalk, H.-D. Nuhn, S.V. Milton, P.L. Ottaviani, A. Renieri, “Enhancement of the radiation power at saturation in a high-gain, single-pass, free-electron laser employing a multi-wavelength magnetic undulator device,” 2002.

S.G. Biedron, N. Gopalsami, J.W. Lewellen, S.V. Milton, J.S. Schneider, L.R. Skubal, “High-Power long wavelength sources including the THz frequency range for applications including those to Homeland Security,” 2002.

Invention Disclosures to Colorado State University

S.V. Milton, S.G. Biedron, and A. D’Audney, “Pulsed-wire magnetic measurement system,” Tech ID: 15-068.

Technology Transfer from Colorado State University

To Kyma, S.r.l., “Pulsed-wire magnetic measurement system.”

Trademark

Infodelity, U.S. and International Trademark (Madrid Protocol). U.S. Registration Number 5,229,203; Serial Number 86-970,286.

Educational Activities

Advising

Monash University

Co-advisor to Ph.D. student Ms. Evelyne Meier at Monash University, School of Physics. Graduated April 2011. Thesis title: “Optimisation of linear accelerator performance for single-pass free-electron laser operation.”

University of Maryland

Co-advisor to Ph.D. student Mr. Mathew Virgo at the University of Maryland, Department of Electrical and Computer Engineering. Graduated December 2010. Thesis title: “Predications Regarding the Performance of Field Emission Cathodes in Radio Frequency Guns.”

University of New Mexico

Ph.D. Students in Electrical and Computer Engineering

- ◆ *Jorge Alberto Diaz Cruz, M.S., expected graduation 2021, subject area of dissertation – low-level rf systems with traditional and AI-inspired control*
- ◆ *Aasma Aslam, M.S., expected graduation 2021, subject area of dissertation – use of deep learning for optical imaging and control in particle accelerators*
- ◆ *Trudy Bolin, M.S., expected graduation 2022, subject area of dissertation – rf devices for next-generation light sources*
- ◆ *Phillip Huffman, M.S., expected graduation 2022, subject of dissertation – controls*

M.S. Student

- ◆ *Samuel Smith, graduated Spring 2019 (Coursework)*

Ph.D. Student in Mechanical Engineering

- ◆ *Reza Pirayeshshirazinezhad, M.S., expected graduation 2020, subject area of dissertation – intelligent control of spacecraft and particle accelerators*

Colorado State University

Ph.D. Students

- ◆ *Joel Williams, expected graduation Summer 2020, subject area of dissertation – design, fabrication, and implementation of a unique electro-optical sampling diagnostic tailored to high-average power electron beams and free-electron lasers in the hard x-ray regime (Passed Qualifier, Passed the Ph.D. Preliminary Exam)*
- ◆ *Anralee Edelen, expected graduation Spring 2020, “A Foray Into Neural Network Modeling and Control of Particle Accelerators,” (Passed Qualifier, Passed the Ph.D. Preliminary Exam, Passed the Defense)*
- ◆ *Taylan Sipahi, “Beam-Driven Co-linear X-band Energy Booster (CXEB) for a Compact FEL and Improvements to the Engineering of High-Current Pulsed Magnetic Horn Systems,” graduated Spring 2018 (Dissertation)*
- ◆ *Jonathan Edelen, “Theory and Mitigation of Electron Back-Bombardment in Thermionic Cathode Radio Frequency Guns,” graduated Summer 2015 (Dissertation)*
- ◆ *Christopher Hall, “Study of Collective Beam Effects in Energy Recovery Linac Driven Free Electron Lasers,” graduated Spring 2016 (Dissertation)*

M.S. Students

- ◆ *Jorge Diaz Alberto Cruz, graduated Spring 2019 (Coursework)*
- ◆ *Theodore Burselson, “Pillbox Cavity Beadpull Project,” graduated Summer 2013 (Project)*
- ◆ *Jonathan Edelen, “Design and Simulation of the Colorado State University Linear Accelerator System,” graduated Summer 2014 (Thesis)*

- ◆ Karen Horovitz, “Suppression of Higher-Order Harmonics in FEL Systems,” graduated Spring 2015 (Project)
- ◆ Alexander D’Audney, “An Ultra-High Resolution Pulsed-Wire Magnet Measurement System,” graduated Spring 2016 (Thesis)

Undergraduate Students

- ◆ Dylan Ryden and Tekalgn Darebo, senior design students, 2016-2017, subject area – artificial intelligence inspired control systems (ECE 401 and 402 students)
- ◆ Cam Key, Fall 2016, Independent Study, subject area – artificial intelligence inspired control systems
- ◆ Mona Elkady and Andrew Noble, senior design students, 2014-2015, subject area – electron beam position monitor (ECE 401 and 402 students)
- ◆ Max van Keuren and Stephen Watras, senior design students, 2013-2014, subject area – advanced beam position monitor systems (ECE 401 and 402 students)
- ◆ Sky Medicine Bear and Alexander D’Audney, senior design students, 2012-2013, subject area – pulsed wire measurement of a permanent magnet undulator (ECE 401 and 402 students)
- ◆ Christian Carrico, intern*, Summer 2012-Present, subject areas – rf measurement test stand development (Summer 2012) and radiation shield wall calculations and design (Summer 2013); three credit hours earned in ENGR 298 in Fall 2012
- ◆ Alysia Dong, intern*, Summer 2012-Present, subject areas – electromagnet measurement test stand development (Summer 2012) and CSU Accelerator controls (Summer 2013); three credit hours earned in ECE 695 in Fall 2012 and three credit hours earned at the USPAS at CSU in the Summer 2013
- ◆ Anna Bos, intern, Summer 2013, subject area – cathode preparation chamber refurbishment for a radio-frequency photocathode gun
- ◆ Max van Keuren, intern, Summer 2013, subject area – electro-optical sampling system; three credit hours earned at the USPAS at CSU in the Summer 2013
- ◆ Sky Medicine Bear, intern, Summer 2013, subject area – assembly of the CSU Accelerator sub-systems
- ◆ Nabeel Moin, intern, Fall 2012-Summer 2013, subject areas – laser room and CSU Accelerator sub-systems assembly
- ◆ Milica Notaros, intern, Summer 2014, subject area – microwave measurements
- ◆ Siera Straughter, intern, Summer 2014, subject area – microwave measurements
- ◆ Jeff Horton, intern, Summer 2014, subject area – microwave measurements
- ◆ John Hoffman, intern, Summer 2014, subject area – pulsed wire measurement of a permanent magnet undulator
- ◆ Nikolas Clements, intern, Summer 2015, subject areas – radiation shielding, magnetic measurement instrumentation, and controls
- ◆ Diogo Marins, intern, Summer 2015, subject areas – radiation shielding, magnetic measurement instrumentation, and controls

*Note: Developed CSU Accelerators and Beams Internship Program in Spring 2012 – See below for details.

High School Students

- ◆ Hannah Yebudab, intern*, Summer 2012-Spring 2013, subject areas – photocathode-drive laser optical transport line and virtual cathode preliminary design; three credit hours earned in ENGR 298 in Fall 2012
- ◆ Lukas Kang, intern, Summer 2013, subject area – controls documentation for the CSU Accelerator system
- ◆ Kevin Kenny, intern, Summer 2013, subject area – electro-optical sampling system
- ◆ Joshua Smith, intern, Summer 2013, subject areas – assembly of the CSU Accelerator sub-systems and radiation shield wall design
- ◆ Nikhil Xie Bhattasali, intern, Summer 2013, subject area – assembly of the CSU Accelerator sub-systems
- ◆ Joshua Smith, intern, Summer 2014, subject area – pulsed wire measurement of a permanent magnet undulator
- ◆ Kevin Kenny, intern, Summer 2014, subject area – controls
- ◆ Francesco Vassalli, intern, Summer 2014, subject area – controls
- ◆ Neil Rowan, intern, Summer 2015, subject areas – radiation shielding, magnetic measurement instrumentation, and controls

*Note: Developed CSU Accelerators and Beams Internship Program in Spring 2012 – See below for details.

Post-doctoral Researchers

- ◆ *Salvadore Sosa, University of New Mexico, 2019*
- ◆ *Jorge Martinez, Colorado State University, 2014*
- ◆ *Chris Brown, Colorado State University, 2013*

Courses Taught at the University of New Mexico

ECE 651 046 – Problems (Fall 2019)

Trudy Bolin, C-Band RF accelerator cavities

Aasma Aslam, Laser control with CNNs and Gaussian processes

Courses Developed and Taught at Colorado State University

Note: Since 2011, developed five classes at Colorado State University, some of those below are listed with experimental course numbers and some with the permanent numbers.)

ECE 580 – Accelerator Engineering (Summer 2012, Spring 2015) – Experimental class

ECE 543 – Accelerator Engineering (Spring 2016, Spring 2017) – Permanent resident class and also online

ECE 581 - Microwave and Beam Instrumentation Lab* (Fall 2012, Summer 2013, Fall 2014) – Experimental class

ECE 551 – Microwave and Beam Instrumentation Lab* (Summer 2016, Fall 2016) – Permanent resident class

ECE 680 – Advanced Accelerator Engineering (Spring 2013, Fall 2015) – Experimental class

ECE 643 – Advanced Accelerator Engineering – Permanent resident class and also online

ECE 680 – Synchrotron Rad, FELs and Hard X-Ray Optics (Fall 2013, Fall 2015) – Experimental class

ECE 647 – Synchrotron Rad, FELs and Hard X-Ray Optics (TO BE TAUGHT Spring 2017) – Permanent resident class and also online

ECE 580 – Pulsed Power and Intense Beams* (Spring 2014) – Experimental class

ECE 552 – Pulsed Power and Intense Beams* (Spring 2016) –Permanent resident class and also online

*Note that “Microwave and Beam Instrumentation Lab” and “Pulsed Power and Intense Beams” were co-taught with Professor Stephen Milton.

Courses Taught at Colorado State University

ECE 567 – Systems Engineering Architecture (Spring 2015) – Permanent resident class and also online

Courses Taught or Developed at Columbia College

Undergraduate – The Physics of Acoustics for Sound Engineers (Fall 1997)

Undergraduate – The Physics of Dance (Developed in the Spring of 1998)

Colorado State University Internship Development

Developed and executed a paid, competitive internship program for undergraduates and high school students in accelerator and beam engineering. Three students were accepted starting in the summer 2012. In 2013, there were 41 applicants and ten students were accepted into the program. In 2014, there were 30 applicants and seven students were accepted into the program. In 2015, there were 30 applicants and three students were accepted into the program. In 2016, there were 30 applicants and 10 were accepted for this year's virtual internship in controls.

U.S. Particle Accelerator School

Co-led the effort to bring the U.S. Particle Accelerator School (USPAS) to the University of New Mexico for the summer of 2019. This school had the highest number of participants of any USPAS to date.

Co-led the effort to bring the U.S. Particle Accelerator School (USPAS) to Colorado State University (CSU). The courses were CSU listed courses when the USPAS was local at CSU in the summers of 2013 and 2016. The USPAS gave individuals in the Vet School, Physics, ECE, ME, and Computer Science programs the opportunity to take additional courses in accelerators. Details on this U.S. government funded school can be found at <http://uspas.fnal.gov/> Other ECE faculty, Physics faculty, and Vet School faculty are also instructors in this school. Typical USPAS schools attract between 100-200 students from around the world.

The U.S. Particle Accelerator School is a national graduate program that provides graduate-level educational programs in the science of particle beams and their associated accelerator technologies that are not otherwise available to the scientific and engineering communities. It also promotes the development and publication of advanced technology textbooks. USPAS conducts graduate and undergraduate level courses at U.S. universities, holding two such programs per year, one in June and one in January. These courses, running two weeks in duration, take place at leading universities across the United States. By successfully completing the 2-week course requirements, which include forty-five contact hours as well as daily problems and examinations, students earn three semester hours of university credit. Qualified teachers are chosen from national laboratories, universities, and private industry. The result is a large pool of prospective instructors with a rich variety of forefront knowledge and methods. We can therefore cover in our curriculum the broad spectrum of material needed to adequately represent the diverse, multi-disciplinary field of beam physics and accelerator technology. To carry out its educational mission, the USPAS develops programs of courses suitable for universities. Major universities, in partnership with the national laboratories, underwrite the offerings and provide the necessary quality control. Through this administrative framework, universities across the nation can offer our high-quality advanced technology courses.

Guest Lectures in Established Colorado State University Courses

“Synchrotron Radiation,” 26 April, 2011 in ECE 650, Extreme Ultraviolet and Soft X-ray Radiation

Thesis and Dissertation Reviews/Committees

- ◆ *Nicholas D. Kallas, College of Engineering, Department of Electrical and Computer Engineering, University of New Mexico, M.S. Thesis, “Pulse Sharpening Circuit for Explosive Emission Cathode Driver,” 2018.*
- ◆ *Thomas W. Campbell, College of Natural Sciences, Department of Physics, Colorado State University, Ph.D. Dissertation, “Measurement Of The Muon Anti-Neutrino Charged Current Double Differential Cross Section With No Pions In The Final State On Water Using The Pi-Zero Detector At T2K,” 2018.*
- ◆ *Michael LaBrake, Department of Environmental & Radiological Health Sciences, College of Veterinary Medicine, Colorado State University, M.S. Thesis, “Detection of Nuclear Material below Counting Threshold,” 2017.*
- ◆ *Captain (Army) Sarah Sublett, Department of Environmental & Radiological Health Sciences, College of Veterinary Medicine, Colorado State University, M.S. Thesis, “A Comparison of Air Sample at Ground Level and Aerial Gamma Count Rates from the Response to the Fukushima Dai-Ichi Nuclear Power Plant Accident,” 2014.*

- ◆ *Thomas Campbell, College of Natural Sciences, Department of Physics, Colorado State University, M.S. Thesis, "Massive Neutrinos and the See Saw Mechanism," 2014.*
- ◆ *Britt Edquist, Department of Environmental & Radiological Health Sciences, College of Veterinary Medicine, Colorado State University, M.S. Thesis, "Electronic Dosimeter and Thermoluminescent Dosimeter Correlation Study at Catamba Nuclear Station," 2014.*
- ◆ *Uros Puc, Faculty of Electrical Engineering, University of Ljubljana, Slovenia, Ph.D. Dissertation, "Spectroscopic Terahertz Imaging," 2015. (Note, I was not only an external examiner but very involved with his thesis work, performing and analyzing experiments together, and planning future work. Our work is published in NATO reports as well as in a SPIE Conference Proceedings Book.)*
- ◆ *Andrej Svigelj, Faculty of Electrical Engineering, University of Ljubljana, Slovenia, Ph.D. Dissertation, "Optimization of some key parameters of THz imaging system operating at room temperature," 2014. (Note, I was not only an external examiner but very involved with his thesis work, performing and analyzing experiments together, and planning future work. Our work is published in NATO reports as well as in a SPIE Conference Proceedings Book.)*
- ◆ *Mayank Kaushik, Department of Electrical and Computer Engineering, University of Adelaide, Ph.D. Dissertation, "Characterizing and Mitigating Scattering Effects in Terahertz Time Domain Spectroscopy Measurements," 2013.*
- ◆ *Nic Kuon, College of Natural Sciences, Department of Physics, Colorado State University, M.S. Thesis, "Final State Interactions in Neutrino-Nucleus Reactions," 2013.*
- ◆ *Yaw Ren Eugene Tan, School of Physics, Monash University, M.S. Thesis, "A study of coherent synchrotron radiation: intensity enhancement of the Far-IR spectrum by exciting single bunch instabilities," 2013.*
- ◆ *David Connick, College of Natural Sciences, Department of Physics, Colorado State University, M.S. Thesis, "Main Injector Neutrino Oscillation Search (MINOS) and the search for Sterile neutrinos," 2012.*
- ◆ *Bradley Ferguson, Department of Electrical and Computer Engineering, University of Adelaide, Ph.D. Dissertation, "Three dimensional THz inspection systems," 2004.*

Argonne National Laboratory Educational Activities

- ◆ *Recruited and mentored two Ph.D. students (2004-2011). Mentored them through the University of Maryland and Monash University.*
- ◆ *Mentored undergraduate student in a DHS summer program (2004).*
- ◆ *Co-developed the Australian Synchrotron Research Internship Program (2004).*
- ◆ *Co-chaired, along with the Department of Educational Programs co-chair, a tri-state high-school design competition for a display illustrating and describing the Advanced Photon Source synchrotron radiation facility (2003).*
- ◆ *Presented American Association of Physics Teachers (AAPT) and Science and Mathematics Initiative for Learning Enhancement (SMILE) lectures.*
- ◆ *Built two educational particle accelerator demonstrators, one at Argonne and one for EXPO 2000, DESY, Germany.*
- ◆ *Co-developed two accelerator fundamentals courses implemented at the USPAS in 1997 and 2000.*
- ◆ *Co-developed two continuing education-type courses in accelerators and beams for technicians, scientists, and engineers (basic and more advanced).*

Outreach to the K-12 community

Conceptualized, designed, and initiated an architecture, landscape architecture, and civil engineering class for children 6-12 years old. The course was carried out by a licensed landscape architect, licensed architect and professional engineer (civil engineer) in April 2016 and April 2017. (Concept and planning began in early 2015.)

Serving as a technical advisor to the High-School District 230's Collaborative Outdoor Teaching with Technological Advancements and Green Education (230 COTTAGE) – an environmentally friendly center that incorporates new technology to create a unique learning experience for students and the surrounding community.

Ongoing – Host 5-12th grade tour groups to hear the historical background on the architect of the atomic age (Enrico Fermi) and of nuclear energy and related systems (including particle accelerators and lasers). Since my husband and I have in our possession the steamer trunk and monogrammed linens used by Fermi and his wife when escaping Europe in 1938 with their children, we are able to use these props in our discussion of the dawn of the atomic age up to modern day in terms of engineering. (See more information on the contents of the exhibit below.) We first organized the exhibit for a historic home tour in the Beverly and Morgan Park neighborhoods of Chicago in May 2016 and made it primarily available for school groups and scientific functions. Since 2017 was the 75th anniversary of the first sustained nuclear reaction underneath Stagg Field at The University of Chicago on December 2, 1942, we further enhanced the exhibit for several events in that special year, including:

- The 50th anniversary celebration of Fermilab, Batavia, Illinois, June 6-8, 2017;
- The Annual User meeting of Fermilab, Batavia, Illinois, June 6-8, 2017;
- The 2017 International Free-Electron Laser Conference, Santa Fe, New Mexico, August 20-25, 2017;
- The 50th Anniversary Open House of Fermilab, Batavia, Illinois, September 23, 2017 (that welcomed more than 20,000 visitors);
- The 75th Anniversary Nuclear Energy Symposium at Argonne National Laboratory, Lemont, Illinois, September 26, 2017;
- The exhibit and suite of lectures (“The Pope of Physics”) at the Italian Embassy in Washington co-sponsored by the Instituto Italiano di Cultura, Washington, D.C. from October 2 through the end of December 2017.

In 2018, because of the immigration facet of the exhibit, it will also be the centerpoint of several events for the Interfaith Committee on Detained Immigrants (ICDI) that is strongly supported by Senator Durbin in Illinois.

The exhibit contains the steamer trunk used by Enrico, Laura, Nella, and Giulio Fermi on their journey on the RMS Franconia (Cunard Line vessel) departing Southampton, England on December 24, 1938. They arrived in New York on January 2, 1939. They claimed to be leaving Italy on December 6, 1938 in order for Fermi to receive the Nobel Prize on December 10, 1938 in Stockholm, Sweden and then continue on to America (Columbia University) for a six-month visit; they actually had no intention of returning. They fled Europe for reasons that included the fact that Mrs. Laura Fermi was Jewish and to remain in Europe was a grave danger due to Italian and other racial laws. Also included in the exhibit are monogrammed (“EF”) and labeled (“Giulio Fermi”) bed linens brought by Enrico Fermi to the United States from Rome, Italy. For those who love science and engineering, there is a piece of the Chicago Pile (CP) 1, which was once assembled by stacking layers of 45,000 graphite bricks on top of a crude wood framing. The graphite was used as a neutron moderator. The bars had to be cut exactly to fit closely together. Some were drilled with holes to fit lumps of uranium inside, and were alternated with regular “dead uranium” graphite bricks. Others were drilled to fit 14-foot cadmium “control rods” that, when removed, would cause the reaction to go critical. Construction was finished on December 1, 1942. A total of 771,000 pounds of graphite were used to build 57 layers. The pile also used 80,590 pounds of uranium oxide and 12,400 pounds of uranium metal, approximately \$1 million worth of materials. In the “pile”, free neutrons produced by the natural decay of uranium were then absorbed by other uranium atoms, causing nuclear fission of those atoms, and the release of additional free neutrons. Our exhibit also includes several explanation boards with historical photos – two provided by Fermilab and six provided by the University of Chicago and Argonne National Laboratory – that describe both Fermi’s private and scientific life. On loan to us from a private donor is a piece of Chicago Pile 2, which was prototyped at Red Gate Woods as described above. We also have copies of letters from the Atomic Energy Commission and President Nixon regarding the naming of Fermilab in the late 1960s.

Optics demonstration for first graders at Christ the King School, Chicago, Illinois (February 2017).

Visit to Carl Sandburg High School to meet with Juniors and Seniors in AP Physics, Engineering Science, and Computer Science. Lecture and questions and answers (April 28, 2017).

University Service

Colorado State University Committees

Served the University as an appointed member of the internal review committee for the NSF PIRE program, 2014.

Served the University as an appointed member of the Export Control Officer Search Committee, Spring 2014-Fall 2014.

Served the University as an appointed member of the Dean, College of Engineering search committee, Fall 2012-Spring 2013.

Served the University as an elected member of the University Grievance Panel. Elected to serve a three-year term, July 1, 2012 through June 30, 2015.

Served on the program committee (John Harton chair) for the Physics colloquium 27-29 March 2012 sponsored by the Vice-President for Research, Fall 2011-Spring 2012.

Colorado State University, College of Engineering

ESTC, Engineering Student Technology Committee for the College of Engineering, Fall 2016-Fall 2018.

Colorado State University, College of Engineering, Department of Electrical and Computer Engineering Committees

Served the Department as a member of the search committee for the Lab Manager. Reviewed resumes, wrote evaluations, and ranked the candidates for the Research Program Managers, Spring 2012.

Served the Department by sitting on the Committee for attracting Post-docs, Spring 2012.

Colorado State University, Representative for Memorandums of Understanding

CSU Co-Representative for the Memorandum of Understanding between Colorado State University and University of Ljubljana, Slovenia, to promote cooperation in academic, scientific, and technological exchanges including assignment of scientific and engineering staff for research; collaboration for R&D in areas of mutual interest, such as electromagnetic radiation sources, microelectronics, semiconductor materials and devices, and photovoltaics; and creation of white papers and proposals for funding, June 2016 (S. Biedron - ECE, J. Sites - Physics and VPR Office).

CSU Representative for the Memorandum of Understanding between Colorado State University and ENEA, (Agenzia Nazionale per le Nuove Tecnologie, L'energia e lo Sviluppo Economico Sostenibile – Italian Agency for New Technologies, Energy and Sustainable Economic Development), Frascati, Italy, for cooperation on basic and applied accelerator and beam theory and simulation and participation in the research, development, construction, and analysis of experiments in the areas of applications of accelerators and beams; including medical applications, improvements in light sources, and the uses of terahertz radiation, March 2014.

CSU Co-representative for the Memorandum of Understanding between Colorado State University and Fermi National Accelerator Laboratory for joint collaboration in research and development areas of mutual interest, including cooperation on accelerator and beam research (S.G. Biedron - ECE) and participation in research, development, construction and analysis of experiments for high-energy physics (R. Wilson - Physics), March 2013.

CSU Representative for the Memorandum of Understanding between Stanford University/SLAC National Accelerator Laboratory and Colorado State University for the Collaboration on Accelerator Research with Emphasis on X-band Radio Frequency Systems, March 2012.

Items that are university-wide

Robert Wilson (Physics) and I prepared and submitted the application for membership into the elite Universities Research Association – URA (<http://www.ura-hq.org>). We were granted membership in February 2015.

Robert Wilson (Physics) and I helped the Colorado State President, Anthony Frank, with the nomination to stand for election for the URA Board of Trustees. <http://www.ura-hq.org/governance/index.html>. He was elected to the Board in the Spring of 2016.

Internal Recognition

Internal Recognition while at Colorado State University (CSU)

Member of two CSU Programs of Research and Scholarly Excellence (PRSE)

Center for Extreme Ultraviolet (EUV) Science and Technology

Jorge Rocca, Director

High Energy Physics and Particle Astrophysics

Robert Wilson, Director

Director for a Pre-Catalyst for Innovative Partnerships (PRECIP) Program at CSU

“Innovative Partnership in Applying Artificial Intelligence Techniques to Many Parameter Control, Prediction, and Data Analysis of Complex, Highly Nonlinear Systems” (S. Biedron, Director). There are members from the College of Engineering (Biedron, Milton, Young), the College of Natural Sciences (Anderson, Buchanan), and the College of Veterinary Medicine (Johnson).

Federal, NATO, National Academy Significant Panels and Boards – Appointed or Elected

2019: Working Group Co-leader, Cross-Cut Panel on Controls, Computing and Design of Accelerators at the Basic Research Needs Workshop on Compact Accelerators for Security and Medicine, May 6-8, 2019.

2014-2015: Chair, Government visit committee for the three U.S. high-energy physics (HEP) user communities. (In three days we visited 380 legislative offices and were invited to two executive-level discussions at OMB and OSTP as well as to three meetings with the DOE Office of Science Head, DOE HEP leadership, and NSF HEP leadership.)

2013-2015: Elected Executive Committee Member Fermi National Accelerator Laboratory's User Organization.

2013-2014: Co-chair, Government visit committee for the three U.S. high-energy physics (HEP) user communities. (In three days we visited 350 legislative offices and were invited to two executive-level discussions at OMB and OSTP as well as to three meetings with the DOE Office of Science Head, DOE HEP leadership, and NSF HEP leadership.)

2012-2013: Organizing Committee Member, Department of Energy Workshop and Report on "Laser Technology for Accelerators" January 23-25, 2013. Report available on-line as listed in publication section.

2011-2014: Advisor to the Illinois Accelerator Research Center at Fermilab in security and defense, and member of Fermilab's Accelerator Applications Steering Committee.

2011-2012: Department of Energy (DOE) Accelerator Task Force. This committee was tasked to provide facts to DOE for congressional support (one of 13 members in the nation). Report available on-line as listed in publication section.

2009: Served as Co-leader of the Security and Defense Working Group for the Department of Energy's Symposium and Workshop "Accelerators for America's Future." The symposium (public) and workshop (invite-only) brought together scientists and engineers to examine the challenges for identifying, developing, and deploying accelerators to meet the nation's and our allies' needs in Discovery Science, Medicine and Biology, Industrial Applications and Production, Energy and Environment, and Security and Defense. Report available on-line as listed in publication section.

2008-2016: NATO Sensors and Electronics Technology Panel Working Group Member.

2007-2010: Nominated and selected by the National Academies of the United States to participate in the Committee on the Scientific Assessment of Free Electron Laser Technology for Naval Applications to perform a critical technology review of high-power FELs. Report available on-line as listed in publication section.

2004: MW-Panel, Office of Naval Research. (For Official Use Only, No foreigners)

2004: Invited participant and invited speaker for the DOE/NSF/NIH (Department of Energy, National Science Foundation, and National Institutes of Health) Workshop on Opportunities in THz Science, 12-14 February 2004. Report available on-line as listed in publication section.

2003-2015: Free Electron Laser (FEL) Technical Area Working Group (TAWG) Member (Invited) for the High Energy Laser Joint Technology Office of the U.S. Office of the Secretary of Defense (OSD). This working group is operated by the Office of Naval Research and the OSD Naval Liaison. This is now the Advanced Concepts TAWG (as of July 2014).

Conference and Workshop Committees/Organizing Boards/Town Halls/Related Activities

2019-2022: Chair and Member, Scientific Program Committee, 2022 North American Particle Accelerator Conference (NAPAC22), Albuquerque, New Mexico

2019-2020: Member, Scientific Advisory Board (SAB), STRIPE 2020 Spectro-Temporal Shaping of Radiation in Accelerator-Based Photon Emission, Arcidosso, Italy

2019: Invited Delegate, Department of Energy's Innovation XLAB Artificial Intelligence Summit, Chicago, Illinois

2019: Invited Delegate, Department of Energy's Argonne AI Town Hall, Argonne, Illinois; participant in the breakout sessions "Imaging and Scientific User Facilities" and "Facilities Integration"

2019: Chair: Committee to create two IPAC2019 awards, honoring the memory of IPAC2019 Local Organizing Committee Chair Greg LeBlanc, to mentor early career individuals, technical staff, and operators; gave the talk and made presentations at the IPAC2019 awards session

2018-2019: Program Committee Member, 2019 International Committee for Future Accelerators (ICFA) Physics and Applications of High Brightness Beams

2018-2019: Program Committee Member, FEL 2019, 39th International Free Electron Laser Conference

2018-2019: Scientific Program Committee Member, 2019 North American Particle Accelerator Conference (NAPAC19)

2018-2019: Technical Committee Member, IEEE CCWC 2019 : The 9th IEEE Annual Computing and Communication Workshop and Conference

2016-2018: Chair, Technical Committee for Charged Particle Beams and Sources, 2018 (IEEE) International Conference on Plasma Physics (ICOPS)

2017: Conference Committee Member, SPIE's 2016 Advances in Laboratory-based X-Ray Sources, Optics, and Applications VI

2016-2017: Scientific Program Committee Member, Free Electron Lasers Conference 2017 (FEL2017)

2016-2017: Scientific Advisory Board Member, 2017 International Particle Accelerator Conference (IPAC17)

2016: Conference Committee Member, SPIE's 2016 Advances in Laboratory-based X-Ray Sources, Optics, and Applications V

2015-2016: Scientific Program Committee Member and Co-leader of the Industrial Accelerators, Applications, Transfer Sub-Committee, 2016 North American Particle Accelerator Conference (NA-PAC2016)

2015-2016: Scientific Advisory Board Member, 2016 International Particle Accelerator Conference (IPAC16)

2015: Conference Committee Member, SPIE's 2015 Advances in Laboratory-based X-Ray Sources, Optics, and Applications IV

2014-2015: Chair, SPIE's 2015 Advances in X-ray Free-Electron Lasers Instrumentation Conference

2014-2015: Technical Committee Member, SPIE's 2015 Optics & Optoelectronics International Symposium

2014-2015: Program Committee Member, 2015 Free-Electron Laser Conference

2014-2015: Scientific Program Committee Member, 2015 International Particle Accelerator Conference (IPAC15)

2013-2014: Planning Committee Member, OSA International Workshop on Compact EUV & X-ray Light Sources 30-31 October 2014, Washington, DC, USA

2013-2014: Program Committee Member, 2014 Free-Electron Laser Conference

2012-2013: Co-chair, Optical Society of America's Incubator Meeting on Compact Light Sources, November 2013

2011-2013: Local Organizing Committee Member, 2013 North American Particle Accelerator Conference

2012: Program Committee Member, 2012 Free-Electron Laser Conference

2012: Committee Member, 2012 CSU Physics Meeting

2011: Scientific Program Committee Member, 2011 Free-Electron Laser Conference

2011: Program Committee Member, 2011 Particle Accelerator Conference

2010: Program Committee Member, Second Workshop on High-Harmonic Seeding for Present and Future Short Wavelength Free-Electron Lasers (FELs), 4-7 May 2010, Lund, Sweden

2010: Scientific Program Committee Member, 2010 Free-Electron Laser Conference

2010: Program Committee Member, 2010 IR-MMW THz Conference

2008-2009: International Organizing Committee Member, 2009 Particle Accelerator Conference

2008-2009: Scientific Program Committee Member, 2009 Particle Accelerator Conference

2009: Scientific Program Committee Member, 2009 Free-Electron Laser Conference

2008: Chair and Member of the Program Committee, Directed Energy Professional Society, Free-Electron Laser Program

2008-2009: Working Group Leader for Diagnostics and Controls for the Workshop on High Average Power, High Brightness Beams, UCLA, January 2009.

2008: Program Committee Member, Workshop on high-Harmonic Seeding for Present and Future Short Wavelength Free-Electron Lasers (FELs), Frascati, sponsored by ENEA-Frascati, INFN,-Frascati University of Rome, and Sincrotrone Trieste

2008-2009: Chair (2008-2009), one of seven members of the Executive Committee for the SPIE's Optics and Photonics, Optical Engineering & Applications; Representative (2009) for the X-Ray, Gamma-Ray, and Particle Technologies Track

2008: Co-chair (2007-2008), one of eight members of the Executive Committee for the SPIE's Optics and Photonics, Optical Engineering & Applications; Co-representative (2008) with Massimo Altarelli, DESY, for all of the X-Ray, Gamma-Ray, and Particle Technologies Track

2008: Program Committee Member, Timing and Synchronization Workshop, Trieste, Italy, March 26-28, 2008

2006-2007: Program Co-chair, Optics and Photonics, for SPIE Program on X-Ray, Gamma-Ray, and Particle Technologies

2005: Photoinjector Session Organizer and Chair, 2005 Directed Energy Professional Society Meeting, November 2005

2005: Program Committee Member, SPIE Conference on Photonics: Design, Technology, and Packaging II, 11-14 December, 2005, Brisbane, Australia

2005: Co-organizer, 2005 SPIE Conference on Radiation Technologies, X-Ray Systems and Technologies; Fourth Generation X-Ray Sources and Optics II (AM301)

2005: Program Committee Member, Focus Session on Stand-Off Detection, ONSITE 2005, Thirteenth International Conference on On-Site Analysis

2004: Program Committee and organizing Committee Member, Workshop on High Average Power, High Brightness Beams, UCLA, November 2004

2004: Co-chair, plenary event for emerging science and technology at the 2004 international Society for Optics and Photonics (SPIE) Annual Meeting in Denver entitled, "International Workshop on the Emergence of Terahertz Radiation"

2004: International Program Committee Member, 2004 Free-Electron Laser Conference

2004: Co-organizer, 2004 SPIE Conference Radiation Technologies, X-Ray Systems and Technologies; Fourth Generation X-Ray Sources and Optics II (AM301)

2003: Program Committee Member, 2003 Particle Accelerator Conference

2002: Co-organizer, 2002 Free-Electron Laser Conference, Argonne National Laboratory, September 9-13, 2002

2001: Co-organizer, 21st ICFA Beam Dynamics Workshop on Laser-Beam Interactions, Stony Brook, NY, June 11-15, 2001

2001: Co-organizer, Workshop on the Generation and Uses of VUV and Soft X-Ray Coherent Pulses, Lund, Sweden, July 17-21, 2001

Editorial Experience

Member, Editorial Board of Physical Review Accelerators and Beams (PRAB), publication of the American Physical Society (appointed December 22, 2016 for the period January 1, 2017 to December 31, 2019). I represented North and South America. There are always four members to this editorial board: one American, two Europeans, and one Asian.

Member, Guest Editor, IEEE Access Special Section: Advanced Optical Imaging for Extreme Environments.

Member, Editorial Board of IEEE Access (appointed December 8, 2016 for the period January 1, 2017 to December 31, 2019).

Senior Guest Editor, IEEE Transactions on Nuclear Science for the 50th Anniversary of the First Particle Accelerator Conference – Special Issue (2014-2016). Published April 2016.

Associate Editor and Advisory Board Member of IEEE Photonics (2008-2015).

Book editor mentioned in an earlier section entitled “Books.”

Review Experience (Journal and Conference Paper Reviewer and Project/Program Reviews)

Chair and Member of the nine-person Accelerator Test Facility (ATF) Program Advisory Committee (APAC), Brookhaven National Laboratory, which is an Accelerator Stewardship Facility operated through the Office of High-Energy Physics (2019-2024)

Reviewer, 53rd International Conference on Microelectronics, Devices and Materials with the Workshop on Materials for Energy Conversion and their Applications: Electrocalorics and Thermoelectrics (2017)

Participated in the DOE Fermilab Operations Review by giving testimony to the DOE-led review committee on three of the five areas of review – Accelerator Operations, Accelerator Test Operations, and Computing Operations (2016)

Reviewer, Technology Foundation STW (The Netherlands' research council for the engineering and applied sciences)

Reviewer, THz Coherent Light Source, Stockholm-Uppsala Centre for Free Electron Laser Research, Sweden

Reviewer, Wallenberg Academy Fellows, The Royal Academy of Sciences, Stockholm

Reviewer, Physical Review Letters

Assessor, Australian Research Council

Reviewer, Triangle de la Physique, France, a cluster that sustains scientific projects in physics

Reviewer, Department of Energy's NNSA funded project at the Lawrence Berkeley National Laboratory for Laser Plasma generation and use

Chair and Committee Member, Review of the Office of Naval Research investments at Los Alamos National Laboratory

Reviewer, Director's review of the Accelerator and Fusion Research Division at Lawrence Berkeley National Laboratory

Reviewer, Taylor and Francis publishers

Reviewer, Physics of Plasmas

Reviewer, Free-Electron Laser Conference Proceedings

Reviewer, Physical Review Special Topics—Accelerators and Beams

Reviewer, International Journal of Optics

Reviewer, Office of Naval Research's programs at the University of Maryland and Naval Research Laboratory

Reviewer, Czech Science Foundation

Reviewer, Israeli Science Foundation

Reviewer, Proceedings of the IEEE

Reviewer, Dutch Ministry of Economics and Ministry of Science

Reviewer, Dutch Minister of Education, Culture, and Science for the update of the Dutch National Roadmap for Large-Scale Research Infrastructures

Reviewer, Journal of Pharmaceutical Science – analytical tools reviewer

Reviewer, Multi-disciplinary Research Initiative for Free-Electron Lasers for the Joint Technology Office and related Office of Naval Research Programs that funds well over 5M USD in University Programs

Technical reviewer, Soft X-ray Free-Electron Laser Program at BESSY, Berlin, Germany

Reviewer and review panel member, National Science Foundation

Reviewer, SPARX Free-Electron Laser Project, Frascati, Italy

Reviewer, Journal of Directed Energy

Reviewer, Journal of Applied Physics

Reviewer, Applied Physics Letters

Reviewer, Nuclear Instruments and Methods in Physics Research A

Reviewer, European Physical Journal D

Reviewer, Nuovo Cimento B

Reviewer, IR Physics and Technology

Reviewer and Physics Review Panel Member, CRDF (U.S. Civilian Research & Development Foundation), a nonprofit charitable organization created by the United States Government in 1995. This unique public-private partnership was established to promote scientific and technical collaboration between the United States and the countries of the Former Soviet Union (FSU). Participated on a special executive panel of experts for a funding call on “Competition for Research on Minimizing the Effects of Terrorist Acts on Civilian Populations.” Participate on the yearly physics panel. Invited by CRDF and the Latvian Ministry of Science and Education to attend Baltic Dynamics Conference as a special delegation of five U.S. scientists to represent U.S. materials science efforts. The CRDF’s original goals were to:

- ◆ support exceptional peer-reviewed research projects that offer scientists and engineers alternatives to emigration and help prevent the dissolution of the scientific and technological infrastructure of the countries of the FSU;
- ◆ advance the transition of weapons scientists to civilian work by funding collaborative non-weapons research and development projects; and

- ◆ help move applied research to the marketplace and bring economic benefits both to the countries of the FSU and to the United States.

Presentations (Predominantly invited)

S.G. Biedron, “How to do collaborative, international accelerator-based science while still protecting one’s self,” International Expert Meeting, Use of Free Electron Lasers and beyond: Scientific, technological and legal aspects of dual use in international scientific cooperation, DESY and XFEL, November 4-5, 2019, Hamburg, Germany.

S.G. Biedron, “Harnessing data science for the control of systems,” Invited Talk at the International Conference on Accelerator and Large Experimental Physics Control Systems 2019 (ICALEPS 2019) Data Science and Machine Learning Workshop, October 6, 2019, Brooklyn, New York.

S.G. Biedron, “Analytical Research Tools for Research: the systems that make them whole,” Accelerator Science Seminar Enrico Fermi Institute, The University of Chicago, October 21, 2019, Chicago, Illinois.

S.G. Biedron, “Analytical Research Tools for Research: the systems that make them whole,” Center for Ultrafast Optical Science (CUOS) Seminar, College of Engineering at the University of Michigan. September 9, 2019, Ann Arbor, Michigan.

S.G. Biedron, “DOE workshop on Compact Accelerators for Security and Medicine: Initial findings and planned activities AND other thoughts,” NST4Health 2019 Symposium, From technology to oncology, accelerators for better health: New radiation protocols for the fastest recovery, 25 May 2019, Clayton, VIC, Australia.

S. Biedron, “Adding Data Science and More Intelligence to our Accelerator Toolbox,” 2019 International Particle Accelerator Conference, May 19-24, 2019, Melbourne, Australia.

S.G. Biedron, “Much more than a decade of use of intelligent techniques in accelerators and overview of a “new” program on the subject,” 2nd ICFA Workshop on Machine Learning for Charged Particle Accelerators. February 26-March 1, 2019, Paul Scherrer Institut (PSI), Villigen, Switzerland.

S. Biedron, “Using ELI - Things I Would Pursue If I Had Access,” U.S.-European Extreme Light Infrastructure Dialogue—Exploring Opportunities for Increased U.S.-European Cooperation Through the ELI Pillars, February 21-22, 2019, Dolní Břežany, Czech Republic.

S. Biedron, “Intelligent Controls for Particle Accelerators and Other Research and Industrial Infrastructures - one application of AI,” New Mexico Research Spotlight Forum: Artificial Intelligence & Machine Learning, January 29, 2019, Sandia National Laboratory.

S. Biedron, “How Particle Accelerators are Used – Science, Society, and Environment,” St. Charles Rotary Club International Lunch Lecture Series, January 10, 2019.

S. Biedron, “Intelligent Controls and Modeling for Particle Accelerators and Other Research and Industrial Infrastructures,” International Workshop on Emerging Technologies and Scientific Facilities Controls (also known as the International Workshop on Personal Computers and Particle Accelerator Controls – PCaPAC), October 16-19, 2018, Hsinchu, Taiwan.

S. Biedron, “Intelligent Controls for Particle Accelerators and Other Research and Industrial Infrastructures,” Physics Next: Machine Learning, October 8-10, 2018, Riverhead, New York.

S. Biedron, "A few thoughts on why we love particle accelerators (and why we should communicate about them even more to "outsiders")," 2018 International Particle Accelerator Conference, April 30-May 4, 2018, Vancouver, BC, Canada (IEEE Particle Accelerator Science and Technology Award Talk).

S. Biedron, "A Compact Coherent System Architecture and FEL Effects Occurring in the Deeply Saturated Regime," Trends in Free-Electron Laser Physics, May 2016, Erice, Italy.

S. Biedron, "Advanced Controls for Accelerators," Compact (EUV & X-ray) Light Sources Conference of the Optical Society of America's High-Brightness Sources and Light-Driven Interactions Congress, March 2016, Long Beach, California.

S. Biedron, "Directed Energy Education at Colorado State University," Education Workshop of the Directed Energy Professional Society's Annual Directed Energy Symposium, 7-11 March 2016, Albuquerque, New Mexico.

S. Biedron, "Advanced Controls for RF and Directed Energy Systems - This Ain't Your Father's Control System," Directed Energy Professional Society's Annual Directed Energy Symposium, 7-11 March 2016, Albuquerque, New Mexico.

S.G. Biedron, "Towards compact, high-repetition rate coherent light source tools from the mm-wave to gamma rays regimes: basic principles, potential schemes, expected output parameters," MIDEEM Conference 2015, 51st International Conference on Microelectronics, Devices, and Materials, 23-25 September 2015, Bled, Slovenia.

S.G. Biedron, "Industrial, Laboratory, and Academic Partnerships," Talk and Panel Discussion Chair, 2015 International Particle Accelerator Conference, 6 May 2015, Richmond, Virginia.

S. G Biedron, "Towards compact high-repetition free-electron lasers: basic principles, potential schemes, expected output parameters, and optics requirements," SPIE's Damage to VUV, EUV, and X-ray Optics V, 15 April 2015, Prague, Czech Republic.

S.G. Biedron, "Electro-Optical Sampling System for a High-Power ERL-Driven FEL," High-Energy Laser Joint Technology Office, 25 February 2015.

S.G. Biedron, "Neural network based systems for real-time optimization and control," Fermilab Seminar, 9 January 2015, Batavia, Illinois.

S. Biedron, "CSU THz Updates," 5th SET-193 NATO Meeting, 20-21 October 2014, Kaiserlautern, Germany.

S. Biedron, "Beams for Security and Defense," SPIE Visiting Scholar Seminar, 18 September 2014, University of Michigan, Ann Arbor.

S. Biedron, "CSU Accelerator Laboratory – Updates," 4th SET-193 NATO Meeting, 26-27 May 2014, Ljubljana, Slovenia.

S. Biedron, "Electron-Beam Based (MOSTLY) Coherent Radiators and Traditional Lasers for Security and Defense," 3 February 2014, Colorado State University, Fort Collins, Colorado.

S. Biedron, "Photons for Security and Defense," Illinois Institute of Technology Physics Colloquium, 17 October 2013, Chicago, Illinois.

S. Biedron, "Non-Invasive Detection and Characterization of Beams," Fourth Annual Directed Energy Professional Society's Advanced High-Power Laser Review, 2013, Santa Fe, New Mexico.

S. Biedron, "Electron-Beam Based Coherent Radiators and Traditional Lasers for Security and Defense," CLEO 2013, 9-14 June 2013, San Jose, California.

S. Biedron, "THz Updates for CSU," 2nd SET-193 NATO Meeting, 1 May 2013, Baltimore, Maryland.

S.G. Biedron, "Directed Energy Education: A Few Experiences," Directed Energy Education Workshop, 30 November 2012, Albuquerque, New Mexico.

S.G. Biedron, "Beam Instabilities: Recent Experimental and Simulated Results," Fifteenth Annual Directed Energy Symposium, 26-30 November 2012, Albuquerque, New Mexico.

S.G. Biedron, "Nonlinear Harmonic Selection in an FEL Undulator System," Fifteenth Annual Directed Energy Symposium, 26-30 November 2012, Albuquerque, New Mexico.

S. Biedron, "Bright Lights* for Science and Technology (*From Accelerator Based Sources)," SPIE Student Chapter Meeting, 12 November 2012, Colorado State University, Fort Collins, Colorado.

S.G. Biedron, C.S. Menoni, S.V. Milton, "ONR and JTO funded (or relevant) research at Colorado State University," FEL Technology Area Working Group, September 2012, UCLA, Los Angeles, California.

S. Biedron, "THz at CSU," 1st NATO SET-193 Meeting, 3-4 September 2012, Paris, France.

S.G. Biedron, S.V. Milton (CSU) and G.P. Gallerano (ENEA), "Compact, E-beam Based mm-and THz-wave light Sources," Workshop on Terahertz Sources for Time Resolved Studies of Matter, July 30-31, 2012, Argonne National Laboratory, Argonne, Illinois.

S.G. Biedron, "Beam Instabilities, Focus: Impact of CSR and LSC on the Operation of ERL Driven FELs," Third Directed Energy Professional Society's Advanced High-Power Laser Review, 2012, Broomfield, Colorado.

S. Biedron, "Predominately X-ray Accelerator-Based Light Sources," Marquette University Physics Colloquium, 19 April 2012, Milwaukee, Wisconsin.

C.S. Menoni, S.G. Biedron, and S.V. Milton, "From optical coatings to accelerators ONR/JTO funded research at Colorado State University," FEL Technology Area Working Group, March 2012, Arlington, Virginia.

S. Biedron for the Boeing Innovative Prototype Free-Electron Laser Team "Commissioning & Test Approach," Office of Naval Research's Critical Design Review, 20-22 March 2012, Arlington, Virginia.

S. Biedron, "The Science, Technology, Beauty and Use of Particle Accelerators," College of Engineering Innovators Breakfast, 3 April 2012, Denver, Colorado.

S. Biedron and S. Milton, "Defense and Security," U.S. Department of Energy Accelerator R&D Task Force, Briefing of Findings to DOE, 13 February 2012, Lawrence Berkeley National Laboratory, Berkeley, California.

S. Biedron and S. Milton, “Accelerators for Security and Defense,” DOE Accelerator Task Force Working Meeting, 9 January 2012, Argonne National Laboratory, Argonne, Illinois.

S. Biedron, “Non-Intercepting Diagnostics for High Repetition Rate Electron Beams,” High Energy Laser Joint Technology Office, 9 December 2011, Albuquerque, New Mexico.

S. Biedron, “Injector Validation, Commissioning & Testing,” Boeing Injector Review for the Office of Naval Research’s Innovative Naval Prototype Free-Electron Laser, 6 December 2011, Boeing, Albuquerque, New Mexico.

S. Biedron, “THz updates,” NATO SET Panel meeting December 4-6, 2011, Kaiserslautern, Germany.

S. Biedron, “Accelerators for Security and Defense for our Nation and Allies,” DOE Accelerator Task Force Meeting 1 December 2011, Rockville, Maryland.

S. Biedron, “Directed Energy at CSU,” Office of Naval Research Review, November 2011, Arlington, Virginia.

S. Biedron, “Experimental and Simulation Investigations of Beam Transport Challenges,” High Energy Laser Joint Technology Office Kick-off Meeting, 21 October 2011, Fort Collins, Colorado.

S. Biedron et al., “Rapid FEL Facility Build-Up Experiences,” Directed Energy Professional Society’s Advanced High Power Lasers Conference, 6-9 June 2011, Santa Fe, New Mexico.

S. Biedron (speaker) for the CSU team of PIs Biedron, Menoni, and Milton, “CSU Activities for the Navy,” Office of Secretary Defense’s High Energy Laser (HEL) Joint Technology Office’s (JTO) Free Electron Laser Technical Area Working Group, 9-10 June 2011, Santa Fe, New Mexico.

S.G. Biedron, “Bright Lights for Science and Technology,” Invited Plenary Speaker, 20th Anniversary of the Optical Society of Korea (OSK), October 20, 2009, Gwangju, Korea. [Note: One representative each from the Optical Society of America and the SPIE were invited to present Plenary talks. John Hall (Nobel Prize winner 2005) represented the Optical Society of America and I was invited to represent the SPIE. The OSK was established in collaboration with the SPIE and the OSA.]

S.G. Biedron, “Office of Naval Research, Australia Visit 2009,” Defence Science and Technology Office, October 2009, Melbourne Australia.

S.G. Biedron, “Office of Naval Research, Australia Visit 2009,” Defence Science and Technology Office, Woomera Test Range Headquarters, October 2009, Adelaide, Australia.

S.G. Biedron, “THz Activities of Argonne and Collaborators,” 4th Sensors and Electronics Technology Panel Business Meeting, 22-24 October 2008, NATO C3 NATO, The Hague, Netherlands.

S.G. Biedron, “Novel Terahertz Sources and Applications to Security,” NATO-SET 129, 19-20 May 2008 Bucharest, Romania.

S.G. Biedron, “U.S. Laboratory’s Capabilities in and Available Technical Assets for FELs,” Free-Electron Laser Innovative Naval Prototype Industry Days, Office of Naval Research, 7 May 2008, Arlington, Virginia.

S.G. Biedron, "Status of Injectors – Argonne," Free-Electron Laser Innovative Naval Prototype Industry Days, Office of Naval Research, 7 May 2008, Arlington, Virginia.

S.G. Biedron, "Particle Accelerators as Sources of Probing Radiation for Materials Science Applications," Invited Speaker at Baltic Dynamics Workshop by the Latvian Ministry of Education and Science and the Investment and Development Agency of Latvia (LIAA), September 13, 2007, Riga, Latvia.

S.G. Biedron, "Enabling Technologies for Compact Airborne Accelerators," DARPA presentation, July 26, 2007, Arlington Virginia.

S.G. Biedron, "Compact MW-class IR FEL Operating at 90K for Airborne Applications," U.S. Air Force presentation, Future Science & Technology Exploration Branch (HQ USAF/A8XC), Future Concepts & Transformation Division, June 2007, Arlington, Virginia.

S.G. Biedron, "Navy Investments in Free-Electron Lasers and Beam Physics and Argonne National Laboratory DoD Activities," Defence Science and Technology Organization Briefing, Fisherman's Bend, 21 March 2007, Melbourne, Australia.

S.G. Biedron, "Investigation of Normal-Conducting and Superconducting RF Guns with Tunable Pulse Compression and Higher-Order Modes," FEL Technology Area Working Group, 26 August 2006, Berlin, Germany.

S.G. Biedron, "Negative Electron Affinity Photocathodes as Sources for High Average Current Radio Frequency Guns," FEL Technology Area Working Group, 26 August 2006, Berlin, Germany.

S.G. Biedron, "Navy Investments in Free-Electron Lasers and Beam Physics and Argonne National Laboratory Activities," ONR Global London Briefing, July 19 2006, London, UK.

S.G. Biedron, "Negative Electron Affinity Photocathodes as Sources for High Average Current Radio Frequency Guns," Joint Technology Office Briefing, 31 May 2006, Los Alamos National Laboratory, Los Alamos, New Mexico.

S.G. Biedron, "Negative Electron Affinity Photocathodes as Sources for High Average Current Radio Frequency Guns," January 2006, Joint Technology Office, Albuquerque, New Mexico.

S.G. Biedron, "Long Operational Time, Multiple Use Aircraft," Air Mobility Command, Scott Air Force Base Technology Days, 1-3 June 2005, Scott AFB, Illinois.

S.G. Biedron, "Multiharmonic Undulator," 1 November 2005, Joint Technology Office, Albuquerque, New Mexico.

S.G. Biedron, "Thermionic-RF Electron Gun," 31 October 2005, Joint Technology Office, Albuquerque, New Mexico.

S.G. Biedron, "Production and Uses of Beams for Homeland Security," The University of Chicago Review Committee for Argonne National Laboratory's National Security Portfolio, August 28-30 2005, Argonne, Illinois.

S.G. Biedron, "Investigation of Normal-Conducting and Superconducting RF Guns with Tunable Pulse Compression and Higher-Order Modes," Joint Technology Office Annual Review, 3-5 May 2005, Albuquerque, New Mexico.

S.G. Biedron, "The Generation of Terahertz Radiation from Electron Beams" Department of Homeland Security Partnering Opportunities Workshop, 26-28 April 2005, Boston, Massachusetts.

S.G. Biedron, "Investigation of Normal-Conducting and Superconducting RF Guns with Tunable Pulse Compression and Higher-Order Modes, Option Year Presentation," 3 March 2005, Joint Technology Office, Albuquerque, New Mexico.

S.G. Biedron "Injector Overview Technology," Office of Secretary Defense's High Energy Laser (HEL) Joint Technology Office's (JTO) Free Electron Laser Technical Area Working Group, February 2005, Monterey, California.

S.G. Biedron, "Negative Electron Affinity Photocathodes as Sources for High Average Current Radio Frequency Guns," 13 January 2005, Joint Technology Office, Albuquerque, New Mexico.

S.G. Biedron, "Coherent radiators including short-wavelength, high-gain, single-pass, free-electron lasers and associated exotic schemes," Invited Colloquium Lecturer, 22 December 2004, The University of Twente, Technische Natuurwetenschappen, Enschede, Netherlands.

S.G. Biedron for the ANL Beam Team, "Argonne National Laboratory's Beam Physics Activities and Site Capabilities of Interest to the MW Goal," MW Panel Meeting 21-22 October 2004, Arlington, Virginia.

S.G. Biedron, "The Use of Terahertz Radiation for Global Homeland Security - Focus on Compact Electron Beam Based Sources." Invited Speaker, TeraHertz for Defence and Security, A Defence Science Technology Office workshop at the frontier of technology, Dec 16-17, 2004, Adelaide, Australia.

S.G. Biedron, "The Generation and Applications of Terahertz Radiation with a Focus on Terahertz from Electron Beams," Invited Speaker, Day of Beam Physics, December 2004, Australian National University, Canberra, Australia.

S.G. Biedron, "Coherent radiators including short-wavelength, high-gain, single-pass, free-electron lasers and associated exotic schemes," Invited Lecturer, the Czech Academy of Sciences, Institute of Physics, September 2004, Prague, Czech Republic.

G.P. Gallerano and S.G. Biedron, "Overview of THz Sources," Invited Plenary Session, 2004 Free-Electron Laser Conference, August 29-September 3, 2004, Trieste, Italy.

S.G. Biedron, "Table-top Accelerator-Based Light Sources," Invited Speaker at the DOE/NSF/NIH (Department of Energy, National Science Foundation, and National Institutes of Health) Workshop on Opportunities in THz Science, 12-14 February 2004, Pentagon City, Virginia.

S.G. Biedron, "Free Electron Lasers and Exotic Photon Production; potential joint areas of interest," Naval Postgraduate School Seminar, January 26 2004, Monterey, California.

S.G. Biedron, "Terahertz Sources for Stand-Off Detection," ONSITE 2004, Twelfth International Conference on On-Site Analysis, January 12-15, 2004, Arlington, Virginia.

S.G. Biedron, "Investigation of Normal-Conducting and Superconducting RF Guns with Tunable Pulse Compression and Higher-Order Modes," Joint Technology Office (JTO) presentation for the Department of the Air Force's call for the Development of Directed Energy Weapons, December 2003, Albuquerque, New Mexico.

S.G. Biedron and J.W. Lewellen, "Argonne capabilities for the Navy's FEL," Office of Secretary Defense's High Energy Laser (HEL) Joint Technology Office's (JTO) Free Electron Laser Technical Area Working Group, October 2003, Albuquerque, New Mexico.

S.G. Biedron, "Free Electron Lasers and Exotic Photon Production," Naval Research Laboratory, VIP Guest of Captain David Schubert, Commanding Officer, 15 September 2003, Washington, D.C.

S.G. Biedron, "Evolution of Transverse Modes in a High-Gain Free-Electron Laser," 2003 Free Electron Laser Conference and Users Workshop, September 8-12, 2003, Tsukuba, Japan.

S.G. Biedron, "High Power T-Ray Source for Homeland Security," USDA Review at Argonne, May 2003, Argonne, Illinois.

S.G. Biedron, "Overview of short-wavelength free-electron lasers and exotic schemes," 33rd Winter Colloquium on The Physics of Quantum Electronics, 5-9 January, 2003, Snowbird, Utah.

S.G. Biedron, "Upgrade of the MAX-Laboratory and active Free-Electron Laser Projects," FOI (Swedish Defence Agency), August 2002, Linköping, Sweden.

S.G. Biedron, "Exotic Harmonic Generation Schemes in High-Gain Free-Electron Lasers," LASE 2002, High-Power Lasers and Applications, Directed Energy, Laser and Beam Control Technologies, SPIE, 22 January 2002, San Jose, California.

S.G. Biedron for the LEUTL Commissioning Team, "The Low-Energy Undulator Test Line: A SASE FEL Operating in Wavelength from 660 to 120 nm," 8th International Conference on X-Ray Lasers, Aspen, Colorado, 27-31 May 2002.

S.G. Biedron, "Impact of Electron Beam Quality on Nonlinear Harmonic Generation in High-Gain Free-Electron Lasers," the 21st ICFA Beam Dynamics Workshop on Laser-Beam Interactions, June 11-15, 2001, Stony Brook, NY.

S. Biedron, "LEUTL: A SASE FEL Operating Down to 130 nm," Center for Beam Physics Seminar Series, 18 January 2002, Lawrence Berkeley National Laboratory, Berkeley, California.

S. Biedron, "Status of the LEUTL FEL Project," INFN-LNF Frascati Laboratory Seminar Series, 24 July 2001, Frascati, Italy.

S. Biedron, "Recent Developments in Single-Pass, High-Gain Free-Electron Lasers," ENEA Laboratory Frascati, 23 July 2001, Frascati, Italy.

S. Biedron, "Status of the APS SASE FEL," MAX-Laboratory Colloquium, 8 May 2001, Lund, Sweden.

S. Biedron, "Impact of Electron Beam and Undulator Quality on Nonlinear Harmonic Generation in High-Gain Free-Electron Lasers," American Physical Society Meeting, Session of Accelerator Systems and Radiation Sources, 28 April-1 May 2001, Washington, DC.

S. Biedron, LEUTL Operational Readiness Review Talk to the Department of Energy, Advanced Photon Source, April 2001, Argonne National Laboratory, Argonne, Illinois.

S. Biedron, "The Low-Energy Undulator Test Line (LEUTL) at the Advanced Photon Source (APS)," Advanced Photon Source, 4 April 2001, Argonne National Laboratory, Argonne, Illinois.

S. Biedron, "Everything You Wanted to Know About Photocathode-rf Guns in Forty Minutes or Less," Advanced Photon Source, 7 March 2001, Argonne National Laboratory, Argonne, Illinois.

S. Biedron, "Everything You Wanted to Know About Lasers in Forty Minutes or Less," Advanced Photon Source, 7 February 2001, Argonne National Laboratory, Argonne, Illinois.

S.G. Biedron, "Modular Approach to Achieving the Next Generation Light Source," the 2000 International Free-Electron Laser Conference, Duke University, August 13-18, 2000, Durham, North Carolina.

S.G. Biedron et al., "Nonlinear Harmonic Generation in High-Gain, Single-Pass FELs and the First Lasing of the APS SASE FEL," the DESY Linear Collider and TTF Project Meeting, May 19, 2000, Hamburg, Germany.

S.G. Biedron, "Third Generation Light Sources and Beyond; Layout and Design with Room for the Future," invited speaker at the Joint Daresbury and Rutherford Appleton CLRC Meeting, May 11-12, 2000, Rutherford Appleton Laboratory, Oxfordshire, UK.

S.G. Biedron, "Higher Harmonic Components in High-Gain, Single-Pass, Free-Electron Lasers," the Annual American Physical Society Meeting, April 29 - May 2, 2000, Long Beach California.

S.G. Biedron, "Everything You Wanted to Know About Free Electron Lasers in Two Hours or Less," Lecture Series at MAX-Lab, January 11th and 13th 2000, Lund University, Lund, Sweden.

S.G. Biedron, Invited Session Leader and Speaker for Harmonics in Free-Electron Lasers for the X-Ray FEL Theory and Simulation Workshop, 23-24 September, 1999, Stanford Linear Accelerator Center, Menlo Park, California.

S. Biedron, "Nonlinear Harmonic in Free-Electron Lasers," University of Chicago, Accelerator Advisory Committee Review Talk, September 1999, Argonne National Laboratory, Argonne, Illinois.

S.G. Biedron, "Nonlinear Harmonic Generation and Proposed Experimental Verification in SASE FELs," 1999 International FEL Conference, August 23-28 1999, Hamburg, Germany.

S.G. Biedron, "The Advanced Photon Source at Argonne National Laboratory," speaker for the Loyola University Department of Physics, April 1999, Chicago, Illinois.

S.G. Biedron, "Development of a 3D FEL code for the simulation of a high-gain harmonic generation experiment," Free Electron Laser Challenges II, SPIE, January, 1999, San Jose, California.

S.G. Biedron et al., "The APS On-Line Logbook," The 1998 Workshop on Accelerator Operations, May 1998, Vancouver, British Columbia, Canada.

S. Biedron, "High-Gain Harmonic Generation," University of Chicago, Accelerator Advisory Committee Review Talk, May 1998, Argonne National Laboratory, Argonne, Illinois.

S.G. Biedron, "Finding the Path to the Fourth Generation Light Source: A review of the BNL/ANL High-Gain Harmonic Generation (HG) Experiment and the APS Low Energy Undulator Test Line (LEUTL)," invited seminar at the Saskatchewan Accelerator Laboratory, May 1998, Saskatoon, Saskatchewan, Canada.

S.G. Biedron, "The Electron Linear Accelerator for Education," Annual American Physical Society Meeting, April 18 - 21, 1998, Columbus, Ohio.

S.G. Biedron, "Status of the Electron Linear Accelerator for Education (ELLE)," Chicago Section of the American Association of Physics Teachers (AAPT), November 1997, Chicago, Illinois.

S.G. Biedron, "Status of the Accelerator-Based Argonne Information Center (AIC) Exhibit," Chicago Section of the American Association of Physics Teachers (AAPT), November 1997, Chicago, Illinois.

S.G. Biedron, "The Electron Linear Accelerator for Education (ELLE)," Chicago Section of the American Association of Physics Teachers (AAPT), April 1997, Chicago, Illinois.

S.G. Biedron, "The Advanced Photon Source: A place for synchrotron radiation research and advanced accelerator physics," Chicago Section of the American Association of Physics Teachers (AAPT), November 1996, Chicago, Illinois.

S. Biedron, "Overview of the University of Physics, an interactive multimedia physics package," Chicago Section of the American Association of Physics Teachers (AAPT), November 1996, Chicago, Illinois.

S.G. Biedron and S. Popp, "Tying it all together: Fine Arts, Physics, and Math," lecture and demonstration for Science and Mathematics Initiative for Learning Enhancement (SMILE), March 1995, Chicago, Illinois.

Technically Related Education

Continuing Education at Professional Conferences or through Professional Organizations

EPA - 8-Hour Lead Safe Renovation Initial Course per 40 CFR Part 745.225 (Certificate Number – R-I-8358-1552298), June 2015.

300 MHz – 100 GHz (High-power) Radio-frequency Radiation Safety Training, May 2015.

Pulsed Laser Effects - A General Overview (Classified, Secret) course at the Directed Energy Professional Society Symposium, November 2012; .35 CEU (Continuing Education Units).

Ultrashort Laser Induced Filaments: Propagation in Transparent Media, course at the Directed Energy Professional Society Meeting of the Advanced High-Power Laser Review, June 2011; 0.35 CEU.

Beam Quality course at the Directed Energy Professional Society Meeting of the Advanced High-Power Laser Review, June 2010; 0.35 CEU.

Windows, Substrates, and Coatings for HEL Applications course at the Directed Energy Professional Society Meeting of the Advanced High-Power Laser Review, June 2010; 0.35 CEU.

Introduction to High Power Microwave Systems course at the Directed Energy Professional Society Meeting, October 2004; 0.35 CEU.

High Power Microwave Technologies course at the Directed Energy Professional Energy Professional Society Meeting, October 2004; 0.35 CEU.

High-Energy Lasers course at the Directed Energy Professional Society Meeting, October 2003; 0.35 CEU.

Atmospheric Propagation course at the Directed Energy Professional Society Meeting, October 2003; .35 CEU.

U.S. Particle Accelerator School Courses

The U.S. Particle Accelerator School is a national graduate program that provides graduate-level educational programs in the science of particle beams and their associated accelerator technologies that are not otherwise available to the scientific and engineering communities. They also promote the development and publication of advanced technology textbooks. They conduct graduate and undergraduate level courses at U.S. universities, holding two such programs per year, one in June and one in January. These courses, running two weeks in duration, take place at leading universities across the United States. By successfully completing the 2-week course requirements, which include forty-five contact hours as well as daily problems and examinations, students earn three semester hours of university credit. Qualified teachers are chosen from national laboratories, universities, and private industry. The result is a large pool of prospective instructors with a rich variety of forefront knowledge and methods. Therefore the curriculum can cover the broad spectrum of material needed to adequately represent the diverse, multi-disciplinary field of beam physics and accelerator technology. To carry out its educational mission, the USPAS develops programs of courses suitable for universities. Major universities, in partnership with the national laboratories, underwrite the offerings and provide the necessary quality control. Through this administrative framework, universities across the nation can offer high-quality advanced technology courses.

Dr. Biedron took most of the graduate credit through Indiana University that co-lists the USPAS courses in order that these additional courses would be part of one transcript. (Exception is UC Berkeley).

USPAS/IU (Held in Tuscon) – Management of Scientific Laboratories, 3 credit hours [2000]

USPAS/IU/University of Chicago – Hard X-ray Synchrotron Radiation Optics, 1.5 credit hours [1999]

USPAS/IU/University of Chicago – Digital Signal Processing Fundamentals with Applications to Accelerators, 1.5 credit hours [1999]

USPAS/IU/Vanderbilt University – Medical Applications of Accelerators, 1.5 credit hours [1999]

USPAS/IU/Stanford University – Microwave Measurements, 3.0 credit hours [1998]

USPAS/IU/University of Texas at Austin – Linear Accelerators, 3.0 credit hours [1998]

USPAS/IU/Massachusetts Institute of Technology – Intense Pulsed Electron and Ion Beams, 1.5 credit hours [1997]

USPAS/IU/ Massachusetts Institute of Technology – Electromagnetic Radiation, 1.5 credit hours [1997]

USPAS/University of California at Berkeley – Beam Experiments: Methods and Theory, 3.0 credit hours [1997]

Other Accelerator Education

CERN Intermediate Accelerator School [1995], received 3.0 graduate self-study credits through the Illinois Institute of Technology

DRAL Rutherford Appleton Laboratory [1995] – *ISIS Division (Pulsed Neutron Spallation Source) – Accelerator Physics and Operations, United Kingdom*, received 3.0 graduate self-study credit through the Illinois Institute of Technology

CERN Beginner Accelerator School [1994], received 3.0 graduate self-study credits through the Illinois Institute of Technology

Other Education

ACEER [1995]

(Amazon Center for Environmental Education and Research), Iquitos, Peru

Three-week seminar course

Morton Arboretum [1993]

Plant Taxonomy; Lisle, Illinois

3.0 credit hours graduate course

Illinois Institute of Technology

Graduate Physics. Took basic graduate physics coursework while working at Argonne National Laboratory.

Moraine Valley Community College

Core undergraduate courses before transferring to Trinity Christian College.

Architecture, Conservation, and Design

By salvaging, reusing, and recycling existing materials, including entire neglected historic homes, I have reduced the fabrication of materials harming our precious earth. I recycle items such as hardware and fixtures and often take materials that have been discarded (wood, woodworking materials, metals, furniture, etc.) and incorporate them into the homes that I renovate. The items that I collect (literally even from garbage heaps left on the roadside) I set aside for use on future projects or donate to those who need them. In a home restoration project, I leave in place as much as I can, i.e., not going down to the studs and removing materials that need not be removed.

Admitted to the private arts and architecture society the Cliff Dwellers in Chicago, Illinois, based on my contributions to historic architectural preservation.

Historic restoration of a Dutch Colonial constructed in 1904 and its property in the Beverly Hills neighborhood of Chicago, located in the Ridge Historic District.

- ◆ *Background: The first owner, William H. Mehan, was a Manager at the Edison Company (Census 1920). He and his wife Daisy had one child, Harriet. She was 10 in 1920. The architect, James Burns (ca. 1858-1933) was the designer of various houses, flats, stores, factories, and, most prominently, several significant Catholic churches: St. Columbanus on E. 71st, St. Gertrude's in Rogers Park (Burns' neighborhood), and St. Keven at Torrence and 105th.*
- ◆ Selected Exhibitions
 - 2006 East Beverly Garden Club Garden Walk
 - 2016 Beverly Area Planning Association's Home Tour. The entire home and all gardens were featured. Each year for over forty years, several outstanding private residences and a must-see institution are on the Beverly Hills/Morgan Park Home Tour each May. The tour showcases homes in the heart of the Ridge Historic District and nestled among the hills of Beverly/Morgan Park. There are a variety of interior designs, architecturally significant buildings, and beautiful landscapes.

Historic restoration of a Victorian constructed in 1873 and its property in the Morgan Park neighborhood of Chicago, located in the Ridge Historic District.

- ◆ *Background: The Ingersoll-Blackwelder House is located in the Ridge Historic District that includes the Beverly Hills and Morgan Park Neighborhoods in Chicago, Illinois. It was built between 1874 and 1877 by Morgan Park's developer, the Blue Island Land and Building Company, for grain broker John E. Ingersoll and his wife, Harriet Ingersoll. The front of the home is in the Queen Anne style, while the back of the home has Italianate elements. The Queen Anne style front was added by the subsequent owner after the Ingersolls, Morgan Park Village President Isaac Blackwelder. Mr. Blackwelder served as a chief of the Western Department of the Niagara Fire Insurance Company of New York. His wife, Gertrude Blackwelder was a founder of the Morgan Park Women's Club and a member of the community's school board. She was the first woman to cast a vote in an important local election. The Ingersoll-Blackwelder House is considered a contributing building located within the Ridge Historic District, listed on the National Register of Historic Places in 1976. Additional information on the home and historical photos can be found here - www.ingersoll-blackwelderhouse.com. In 2016, a potager (kitchen) garden was designed and added behind the coach house using paver bricks reclaimed from Chicago streets to fabricate the raised garden beds.*
- ◆ Selected Exhibitions
 - 2015 Beverly Area Planning Association's Home Tour. This event is described above. The entire home and front gardens were featured.
 - 2018 Open House Chicago tour. Entire house and property featured. Each year, the Chicago Architecture Center hosts Open House Chicago—a free, two-day public festival that offers behind-the-scenes access to 250+ architecturally, historically and culturally significant sites across the city.

Featured sites include historic mansions, private clubs, sacred spaces, hotels, offices, theaters, and other important properties.

- 2019 Open House Chicago tour. Entire house and property featured.

Wine cellar with dining area for a Spanish/Mediterranean style home in Fort Collins, Colorado.

- ◆ Designed and installed a 2500-bottle wine cellar with custom wine racks and buffet (serving) areas and an Italian cotto-tile patterned floor. This combined wine cellar and private dining area, constructed in a large and otherwise vacant basement area, is accessible via either a spiral staircase from the upper level or a long hallway from the lower level. The temperature is such that the bottles require no additional temperature or humidity control (preserving critical resources) to conserve the wine. The dining area furniture items were secured second-hand (used).