

ANNUAL REPORT

September 1, 2012 – August 31, 2013

NUCLEAR ENGINEERING AND
RADIOLOGICAL SCIENCES

University of Michigan

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Summary of Activities

This is the 16th annual Report of the Nuclear Engineering and Radiological Sciences Department. The purpose of this report is to provide a record of teaching, research and service activities of the department.

NERS Department faculty offered a total of 47 courses including special topics, independent study and doctoral research. Our undergraduate enrollment is stable at a very high level with 137 students in the NERS and Engineering Physics majors. Some 47 students registered in NERS 250, Fundamentals of Nuclear Engineering and Radiological Sciences (our introductory sophomore level course) and 38 students in NERS 311, (our junior level course). The NERS department awarded 38 BSE degrees and 14 Engineering Physics degrees. MS and MSE degrees were granted to 26 students. There were 16 Ph.D. graduates from NERS during this reporting period.

NERS Department continues to attract the highest quality students. Currently, NERS graduate students have earned some 50 prestigious graduate fellowships from the National Science Foundation (10), DoE, NNSA, NRC, DoD, NPSC and DHS. Undergraduate students garnered many prestigious scholarships. The number of undergraduate student internships continues to expand to 26. There has been a great increase in the number of students gaining international experience now including 5 countries. NERS undergraduates and graduate students have also received numerous awards.

NERS faculty taught a class in China that exposed students to several nuclear reactor construction sites and nuclear facilities. NERS faculty participated in panel discussions in the US and China to discuss the implications of the nuclear incident at Fukushima, Japan.

Faculty research expenditures increased to 15.7 million dollars on some 176 research projects from government and industry. The UM Regents have approved \$11.4 million to fund the construction of new laboratories in the former Ford Nuclear Reactor building.

Due to the efforts of our outstanding faculty, students and staff, the future of the Nuclear Engineering and Radiological Sciences Department is extremely bright.

Faculty Honors and Awards

(January 1, 2012 – December 31, 2012)

John Foster

NASA

Faculty Fellowship Award

Zhong He

IEEE RTSD Workshop

Room-Temperature Semiconductor Detector Scientist Award

Karl Krushelnick

UM College of Engineering

Outstanding Research Award

Sara Pozzi

Institute of Nuclear Materials Management

Edway R. Johnson Meritorious Service Award

UM Nuclear Engineering and Radiological Sciences

Outstanding Achievement Award

Alexander Thomas

Air Force Office of Scientific Research

Young Investigator Award

Student Organizations

ALPHA NU SIGMA SOCIETY

In 1983, a chapter of the Alpha Nu Sigma Society, the national honor society for nuclear science and engineering, was formed at the University of Michigan. Approximately 120 undergraduate and graduate students have been inducted into the Alpha Chapter of the Alpha Nu Sigma Society at Michigan since 1983. The honor society emphasizes nuclear education by tutoring current students, and providing outreach activities to educate high school students and the community.

Since 1993, the chapter has recognized a faculty member for contributions to undergraduate and graduate education.

AMERICAN NUCLEAR SOCIETY

Over the past year the American Nuclear Society Student Chapter at the University of Michigan conducted over 9 outreach events, discussing Nuclear energy, technology and engineering to over a thousand people.

These activities included three different high school visits where we taught 9 classes on nuclear technology to a total of 173 students. These high schools ranged from local to inner-city Detroit. Our members did a Boy Scout Merit Badge Program for Nuclear Science for 17 boy scouts. ANS held a town hall on nuclear energy with a panel of experts from the NRC, Entergy, Detroit Edison, and the University of Michigan-Department of Nuclear Engineering, along with an information booth to give out pamphlets and answer questions for over 270 people. We partnered with the Society of Physics Students at U of M to host a Physics Palooza at the Ann Arbor Hands on Museum, where we taught the basics of nuclear fission and radioactive decay to 390 pre-school students, elementary school students and their families. At the same time we talked to around 50 high school girls interested in engineering about nuclear engineering at the University of Michigan as part of the GREAT Day (Girls Research Engineering and Technology Day) hosted by WISE (Women in Science and Engineering).

We used a host of demonstrations, pamphlets and posters to educate the public. We had 2 cloud chambers to show the tracks of radioactive particles; geiger counter and a myriad of sources and shielding material to teach about radiation detection and shielding; and a mouse trap reactor to teach how a chain reaction can be sustained in a nuclear reactor. Our outreach activities were able to make a significant effect in our community, reaching out to the youth and adults of our local area and educating them as to the benefits on nuclear technology and engineering on our society.

The student chapter of ANS also sent participating members to both the professional and student ANS conferences in San Diego and Boston. Students had the opportunity to be exposed to current research within the nuclear community as well as different career opportunities.

Throughout the academic year, ANS hosted monthly poker/game nights where all members were invited to come and socialize while playing poker and many other games that were available. These events were extremely successful as many members participated each time. At the end of the year, a very successful paintball outing was organized by ANS as well. These social events played a great role in increasing active membership within the student chapter.

HEALTH PHYSICS SOCIETY

Formed in 1992, the University of Michigan Student Branch of the Health Physics Society was among the charter groups of student branches. The Health Physics Society is dedicated to the development, dissemination, and application of both the scientific knowledge of and the practical means for radiation protection, with an emphasis on protection of people and the environment from unnecessary exposure to radiation. The student branch has been involved in a number of professional activities, parties, seminars, and public relations activities, including tours, teacher training workshops and visits to high schools for the dissemination of basic information about radiation and radiation health effects.

Faculty Advisor: Kim Kearfott

THE INSTITUTE OF NUCLEAR MATERIALS MANAGEMENT (INMM)

"The mission of the Institute of Nuclear Materials Management (INMM) is to promote advancement and research in the area of nuclear materials management and to implement high ethical and educational standards for those engaged in the nuclear materials management field. The University of Michigan student chapter promotes the INMM mission by hosting professional speakers, facilitating panels and discussions, and providing opportunities to increase awareness and education of the importance of nuclear materials management.

The past 2012-2013 academic year was very successful for INMM, despite several lecture cancellations caused by federal government budget cuts. After beginning the year with practice sessions for students presenting at INMM's annual national conference, the student chapter hosted a variety of speakers that toured the nuclear engineering department, met with students, and gave compelling lectures related to nuclear materials management issues. Speakers included Dr. Dina Chernikova from Chalmers University, former IAEA inspector Shirley Johnson, Dr. John Mattingly from NC State University, and Dr. Chris Pickett from Oak Ridge National Lab. The chapter also facilitated lectures by Aaron Pierce from the University of Michigan Physics Department and Steve Tobin from Los Alamos National Laboratory, who both lectured for the Nuclear Engineering Colloquium.

INMM also participated, for the first time, in a webinar designed to help members improve their presentation skills. Members also engaged in various social activities, including trivia nights, to expand and strengthen the network of people interested in nuclear materials management related issues."

Curriculum

CURRICULUM CHANGES

The following changes were made for AY 2012-2013:

- NERS 320 (Problems in Nuclear Engineering and Radiological Sciences) was changed from 3 to 4 credits. Content was expanded to include some of the topics (particularly partial differential equations) in Math 454.
- Math 454 (Boundary Values and PDEs), CEE 211 (Statics and Dynamics), and ME 320 (Fluids) were dropped as required courses.
- NERS 344 (Fluid Mechanics for Nuclear Engineers) and NERS 444 (Thermal-hydraulics for Nuclear Systems) were added to the curriculum as required courses.
- General electives increased from 10 credits to 12 credits.
- NERS electives – students are required to take two courses from a list of four (NERS 484, 471, 462, and 421). The remaining required credits for the NERS electives are the student's decision.
- SGUS Program – GPA cumulative and Program GPA of 1st term senior year changed from 3.5 to 3.3 (cumulative) and 3.5 (NERS program courses) for automatic acceptance.
- NERS 521 course title changed to Radiation Materials Science I.
- NERS 524 (Nuclear Fuels) course number changed from NERS 522.
- NERS 579 (Physics of Diagnostic Radiology) changed from 3 credits to 2 credits.
- NERS 586 (Applied Radiological Measurements) prerequisites were made mandatory to make sure students have necessary background for lab course.
- New Courses:
 - NERS 290 (Special Topics) for 1st and 2nd year students
 - NERS 299 (Directed Study in Nuclear Engineering and Radiological Sciences) for 1st and 2nd year students
 - NERS 344 (Fluid Mechanics for Nuclear Engineers)
 - NERS 444 (Thermal-hydraulics for Nuclear Systems)
 - NERS 522 (Radiation Materials Science II)
 - NERS 535 (Detection Techniques for Nuclear Non-proliferation)
 - NERS 544 (Monte Carlo Methods)
 - NERS 574 (Computational Plasma Physics)

COURSES OFFERED

| COURSE NO. | COURSE TITLE | TERM | CREDIT HRS |
|---------------------------------|---|--------------|-------------------|
| NERS 211/ENSCEN 211 | Intro to Nuclear Engineering & Radiological Sciences | I, II | 4 |
| NERS 250 | Fundamentals of Nuclear Engineering & Radiological Sciences | II | 4 |
| NERS 311 | Elements of Nuclear Engineering & Radiological Sci I | I | 3 |
| NERS 312 | Elements of Nuclear Engineering & Radiological Sci II | II | 3 |
| NERS 315 | Nuclear Instrumentation Laboratory | II | 4 |
| NERS 320 | Problems in Nuclear Engineering and Radiological Sciences | II | 3 |
| NERS 421 | Nuclear Engineering Materials | I | 3 |
| NERS 425 | Applications of Radiation | II | 4 |
| NERS 441 | Nuclear Reactor Theory I | I | 4 |
| NERS 442 | Nuclear Power Reactors | II | 4 |
| NERS 462 | Reactor Safety Analysis | I | 3 |
| NERS 471 | Introduction to Plasmas | I | 3 |
| NERS 472 | Fusion Reactor Technology | II | 3 |
| NERS 481/BioE 481/ENSCEN 484 | Engineering Principles of Radiation Imaging | II | 2 |
| NERS 484/BioE 484 | Radiological Health Engineering Fundamentals | I | 4 |
| NERS 490 | Special Topics in Nuclear Engineering & Radiological Sciences | All | 1-4 |
| NERS 499 | Research in Nuclear Engineering & Radiological Sciences | All | 1-3 |
| NERS 511 | Quantum Mechanics in Neutron-Nuclear Reactions | II | 3 |
| NERS 512 | Interaction of Radiation and Matter | II | 3 |
| NERS 515 | Nuclear Measurements Laboratory | I | 4 |
| NERS 518 | Advanced Radiation Measurements and Imaging | I (Alt Yrs) | 2 |
| NERS 521 | Radiation Materials Science I | I | 3 |
| NERS 522 | Radiation Materials Science II | II (Alt Yrs) | 3 |
| NERS 524 | Nuclear Fuels | II (Alt Yrs) | 3 |
| NERS 531 | Nuclear Waste Management | II (Alt Yrs) | 3 |
| NERS 535 | Detection Techniques of Nuclear Non-proliferation | I | 4 |
| NERS 543 | Nuclear Reactor Theory II | I | 3 |

| COURSE NO. | COURSE TITLE | TERM | CREDIT HRS |
|------------------------------|--|---------------|-------------------|
| NERS 546 | Thermal Fluids for Nuclear Reactor Safety Analyisics | II | 3 |
| NERS 551 | Nuclear Reactor Kinetics | II | 3 |
| NERS 554 | Radiation Shielding Design | II | 4 |
| NERS 561 | Nuclear Core Design and Analysis I | II | 3 |
| NERS 562 | Nuclear Core Design and Analysis II | IIIA | 3 |
| NERS 571 | Intermediate Plasma Physics I | I | 3 |
| NERS 572/ AppPhy 672 | Intermediate Plasma Physics II | II | 3 |
| NERS 573 | Plasma Engineering | II | 3 |
| NERS 575/EECS 519 | Plasma Generation and Diagnostic Laboratory | II | 4 |
| NERS 576 | Charged Particle Accelerators and Beams | I (Alt Yrs) | 3 |
| NERS 577 | Plasma Spectroscopy | I (Alt Yrs) | 3 |
| NERS 578/EECS 517 | Physical Processes in Plasmas | II (Even Yrs) | 3 |
| NERS 579/EHS 692 | Physics of Diagnostic Radiology | II, IIIA | 3 |
| NERS 580/BioE 580 | Computation Projects in Radiation Imaging | II | 1 |
| NERS 582/BioE 582 | Medical Radiological Health Engineering | II | 3 |
| NERS 583/EHS 683 | Applied Radiation Dose Assessment | II | 4 |
| NERS 585 | Transportation of Radioactive Waste | I (Alt Yrs) | 2 |
| NERS 586 | Applied Radiological Measurements | II | 4 |
| NERS 587 | Internal Radiation Dose Assessment | II | 3 |
| NERS 588 | Radiological Health Engineering Practicum | All | 1-12 |
| NERS 590 | Special Topics in Nuclear Engineering & Radiological Sciences II | All | TBA |
| NERS 599 | Master's Project | I, II, IIIA-B | 1-3 |
| NERS 621 | Nuclear Waste Forms | I (Alt Yrs) | 3 |
| NERS 622/ MSE 622/Mfg 622 | Ion Beam Modification and Analysis of Materials | II (Alt Yrs) | 3 |
| NERS 644 | Transport Theory | I | 3 |
| NERS 671 | Theory of Plasma Confinement in Fusion Systems I | I (Alt Yrs) | 3 |
| NERS 672 | Theory of Plasma Confinement in Fusion Systems II | II (Alt Yrs) | 3 |
| NERS 673 | Electrons and Coherent Radiation | II | 3 |
| NERS 674/ AppPhy 674 | High Intensity Laser-Plasma Interactions | I | 3 |

| COURSE NO. | COURSE TITLE | TERM | CREDIT HRS |
|-------------------|----------------------------|-----------------------|-------------------|
| NERS 799 | Special Projects | All | 1-6 |
| NERS 990 | Dissertation/Pre-candidate | I, II, III III A-B | 2-8 1-4 |
| NERS 995 | Dissertation/Candidate | I, II, II, III A-B | 8 4 |

*Roman numeral indicates term(s) the course will be offered. Fall term, I; Winter term, II; Spring/Summer terms, III A/B.

COURSE ENROLLMENTS

| COURSE | TITLE | FA '12 | WN '13 | Sp/Su '13 |
|---------------|---|---------------|---------------|------------------|
| NERS 211 | Introduction to Nuclear Engr and Radiological Sci | 73 | 90 | |
| NERS 250 | Fundamentals of Nuclear Engr and Radiological Sci | | 47 | |
| NERS 311 | Elements of Nuclear Engr and Radiological Sci I | 38 | | |
| NERS 312 | Elements of Nuclear Engr and Radiological Sci II | | 38 | |
| NERS 315 | Nuclear Instrumentation Laboratory | | 36 | |
| NERS 320 | Principles in Nuclear Engineering and Radiological Sciences | | 35 | |
| NERS 421 | Nuclear Engr Materials | 29 | | |
| NERS 425 | Applications of Radiation | | 19 | |
| NERS 441 | Nuclear Reactor Theory I | 44 | | |
| NERS 442 | Nuclear Power Reactors | | 25 | |
| NERS 462 | Reactor Safety Analysis | 34 | | |
| NERS 471 | Introduction to Plasmas | 36 | | |
| NERS 481 | Engr Principles of Radiation Imaging (BioE 481) | | 20 | |
| NERS 484 | Radiological Health Engr Fundamentals (BioE 484) | 14 | | |
| NERS 490 | Special Topics in Nuclear Engr and Radiological Sci | 39 | 52 | |
| NERS 499 | Research in Nuclear Engr & Radiological Sci | 9 | 14 | |
| NERS 515 | Nuclear Measurements Laboratory | 11 | | |
| NERS 518 | Advanced Radiation Measurements and Imaging | 15 | | |
| NERS 521 | Radiation Effects in Nuclear Materials | 9 | | |
| NERS 522 | Nuclear Fuels | | 7 | |
| NERS 535 | Detection Techniques of Nuclear Non-proliferation | 24 | | |
| NERS 543 | Nuclear Reactor Theory II | 7 | | |
| NERS 546 | Thermal Fluids for Reactor Safety Analysis | 4 | | |
| NERS 551 | Nuclear Reactor Kinetics | | 21 | |
| NERS 554 | Radiation Shielding | | 22 | |
| NERS 561 | Nuclear Core Design and Analysis I | | 5 | |
| NERS 571 | Intermediate Plasma Physics I | 15 | | |
| NERS 573 | Plasma Engineering` | 13 | | |
| NERS 575 | Plasma Generation and Diagnostics Lab (EECS 519) | | 13 | |
| NERS 578 | Physical Processes in Plasmas (EECS 517) | 13 | | |
| NERS 580 | Computation Proj in Radiation Imaging (BioM 580) | | 10 | |
| NERS 586 | Applied Radiological Measurements | | 14 | |
| NERS 590 | Special Topics in Nuclear Engr & Radiological Sci II | 7 | 62 | |
| NERS 599 | Master's Project | 3 | 2 | |

| COURSE | TITLE | FA '12 | WN '13 | Sp/Su '13 |
|---------------|---|---------------|---------------|------------------|
| NERS 622 | Ion Beam Modification and Analysis of Materials | | 7 | |
| NERS 799 | Special Projects | 17 | 12 | |
| NERS 990 | Dissertation-Pre-candidate | 8 | 8 | |
| NERS 995 | Dissertation-Candidate | 63 | 65 | 8 |

Student Academics, Honors, and Employment

Undergraduate Scholarships for 2012-2013

American Nuclear Society Undergraduate Scholarship Award

Rachel Bielajew, Derek Hung, Michael Jarrett, Alexandra Niska Burja, Daniel Nunez, Dylan Rittman

American Nuclear Society Michigan Section

Michael Jarrett

American Nuclear Society Incoming Freshman Scholarship Award

Lauren Coseo, Nicholas Thiros

Andrew A. Kucher Scholarship

Rachel Bielajew, Sean Gray, Alexander McSpaden, Alexander Rhodes

AUC Scholarship

Ryan Leon

William E. Bandemer Scholarship

David Goodman

Bechtel Foundation

Daniel Nunez

Carroll J. Haas Endowed Scholarship

Alexandra Niska Burja

Chihiro Kikuchi Scholarship

Lauren Edson, Aledoni Keci, Kirk Liberty, Daniel Polan

Clara E. Mara Scholarship

Austin Hamilton

Class of 1912E, 1913E & 1915E Scholarship

Barclay Oudersluys

College of Engineering Scholarship
Rachel Bielajew, Sana Cao, Austin Hamilton

George H. Miller Memorial Scholarship
Jesse Bradfield, Sana Cao

Howard W. and Ruth Hoff Sheldon Scholarship
Stephen Barnard, Selman Mujovic

James D. Butt Scholarship Fund
Daniel Nunez

John S. King Scholarship Fund
Scott Richards

Nuclear Engineering Undergraduate Program (NEUP)
Michael Jarrett, Joowon Kwak, Alexandra Niska Burja, Dylan Rittman

Oskar and Elsie R. Loosme Endowed Scholarship
Nickolas Adamowicz

Second Year Undergraduate Merit Scholarship
Derek Hung, Kevin Xu

Undergraduate Honors and Awards for 2012-2013

ANS Student Chapter Outstanding Contribution Award
Andrew Gahan, Theresa Willson

CEDO Undergraduate Achievement Award
Aledoni Keci, Rianna Penn, Guy Wilson

Distinguished Achievement Award
Rachel Bielajew

Outstanding Undergraduate Student Award-Engineering Physics
Qiaochu Li

Outstanding Undergraduate Student Award-NERS
Sean O'Neal

Graduate Fellowships for 2012-2013

American Nuclear Society Graduate Awards

Sean Carney, Travis Trahan

ANS Water Meyers Scholarship Award

Mark Norsworthy

College of Engineering Dean's/Named Fellowship

Timothy Burkey, Thomas Batson

College of Engineering Regent's Fellowship

Jipu Wang

Michigan Institute for Plasma Science and Engineering

Zhaohan He, Sonal Patel, Calvin Zulick

National Academy for Nuclear Training in Nuclear Engineering Fellowship

Edward Harvey

National Physical Sciences Consortium Fellowship

Ayesha Athar, Sonal Patel, Adam Steiner

National Science Foundation Fellowship

Elizabeth Beckett, Steven Brown, Aimee Hubble, Jeffrey Katalenich, William Koehler, Sarah Gucker, Anthony Monterrosa, David Yager-Elorriaga

Natural Sciences and Engineering Research Council of Canada

Eva Sunny

NNSA Nonproliferation Graduate Fellowship

Sonal Joshi, Zachary Whetstone

Rackham Engineering Award Fellowship

David Yager-Elorriaga, Alicia Salazar

Rackham GEM PhD Award

Charles Sosa

Rackham Pre-Doctoral Fellowship

Peng Zhang

U.S. Department of Energy Computational Science Graduate Fellowship

Travis Trahan

U.S. Department of Energy Forensics Fellowship

Jennifer Dolan, Alexis Kaplan, Mateusz Monterial

U.S. Department of Energy Nuclear Energy University Program

Bruce Pierson, Aaron Wysocki, Sean Carney, Michael Rose, Tim Grunloh

U.S. Department of Energy Nuclear Nonproliferation International Safeguards

Mark Norsworthy, Marc Paff, Mark Fuch

U.S. Department of Energy NNSA Stewardship Science Graduate Fellowship

Thomas Saller

U.S. Department of Defense National Defense Science and Engineering Fellowship

Aimee Hubble, Jeffrey Katalenich

U.S. Department of Defense Science, Mathematics, and Research for Transformation Scholarship

Matt Orians, Adam Nelson

Graduate Honors and Awards for 2011-2012

ANS Student Conference Best Paper Award, Nonproliferation and Safeguards Track, MIT, 2012

Alexis Kaplan

College of Engineering Distinguished Leadership Award

Alexis Kaplan

CASL Best Student Poster Session, ORNL 2012

Mitchell Young

Engineering Scholar Power PhD Candidate Achievement Award

Michael Vargas

IEEE Best Student Paper Award, International Vacuum Electronics Conference, Paris, May 2013

Matt Franz

Nuclear Engineering Poster Session, Engineering Graduate Symposium

Elizabeth Beckett

Towner Prize for Outstanding PhD Research

Thomas Saller

United States Youth Alumni Association Scholarship

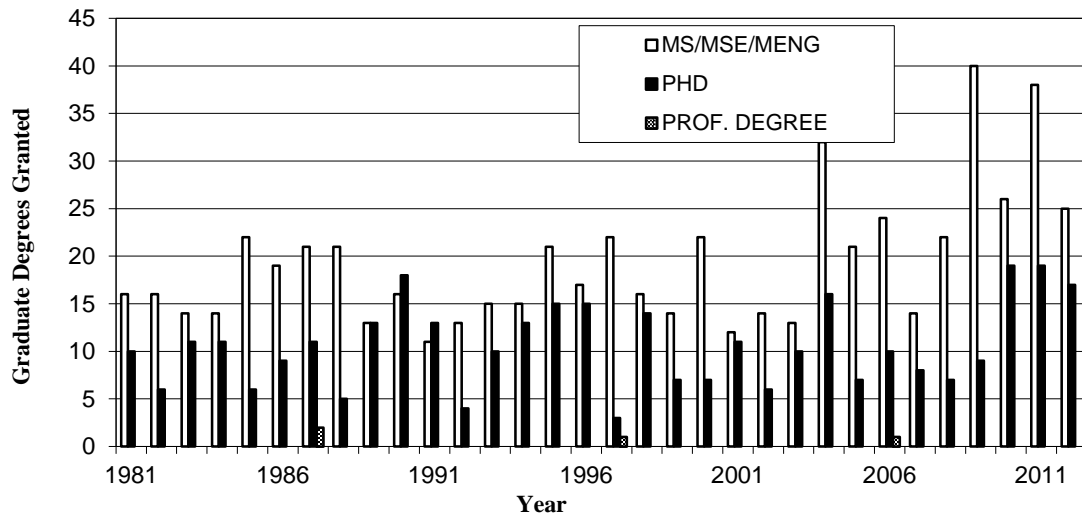
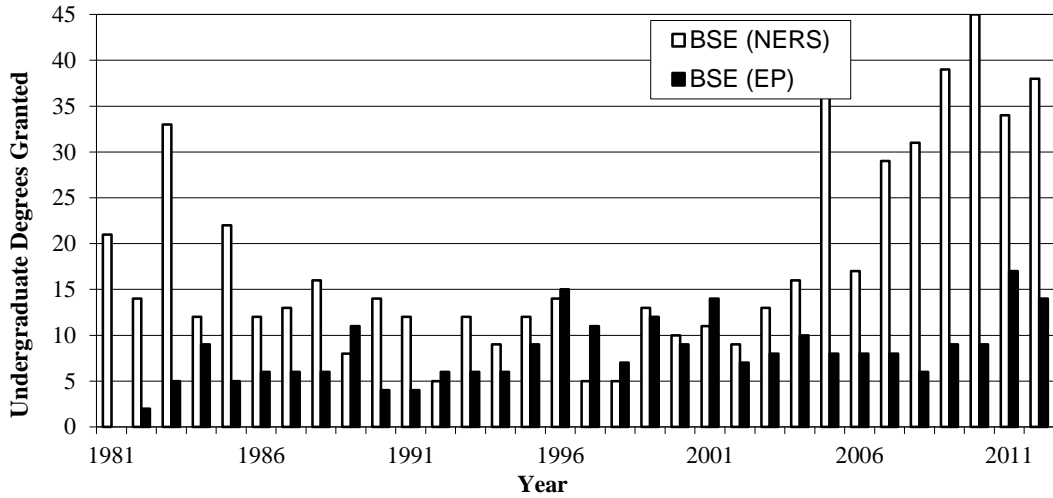
Mark Norsworthy

DEGREES AWARDED BY ACADEMIC YEAR

September 2012 – August 2013

| Degree | Number |
|---|--------|
| BSE in Nuclear Engineering and Radiological Sciences | 38 |
| BSE in Engineering Physics | 14 |
| MSE and MS in Nuclear Engineering and Radiological Sciences* | 26 |
| PhD in Nuclear Engineering and Radiological Sciences, Nuclear Science | 16 |
| Professional Degree (Nuclear Engineer) | 0 |

*16 students continuing in doctoral program



DOCTORAL THESES TITLES

For Degrees Conferred September 2012 – August 2013

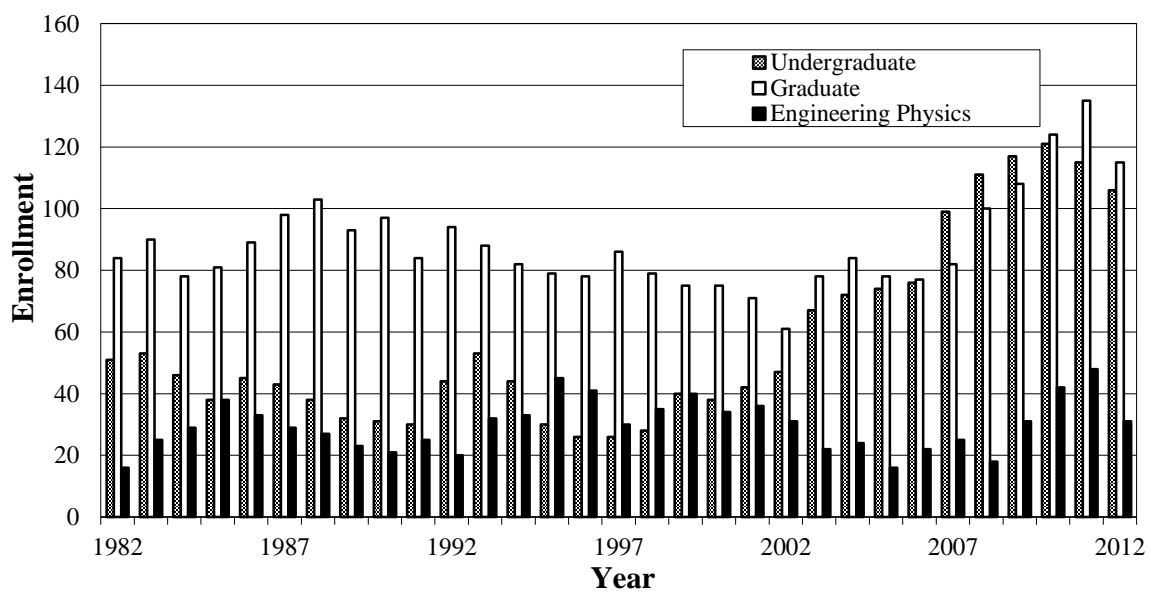
| Name | Thesis Title | Advisor |
|-------------------------|--|----------------------------------|
| Yvan Boucher | Analysis of Cadmium Zinc Telluride Detector Performance and Characteristics for Applications in Gamma-Ray Imaging Spectrometers | Zhong He |
| Jennifer Dolan | Safeguarding Special Nuclear Material by Detecting Fast Neutrons in Liquid Scintillators | Sara Pozzi |
| Adam Hoffman | A Time-Dependent Neutron Transport Method for Nuclear Reactor Kinetics using Method of Characteristics with Time Derivative Propagation | John Lee |
| Aimee Hubble | Experimental Assessment of Plasma Transport in Magnetic Multicusp Ion Sources | John Foster |
| Jason Jaworski | Compton Imaging Algorithms for Position-Sensitive Gamma-Ray Detectors in the Presence of Motion | Zhong He |
| Geehyun Kim | Nanocrystalline Semiconductor Nuclear Radiation Detectors | David Wehe Mark Hammig |
| Brendan Kochunas | A Hybrid Parallel Algorithm for the 3-D Method of Characteristics Solution of the Boltzmann Transport Equation on High Performance Compute Clusters | Thomas Downar |
| J. Tiberius Moran-Lopez | Multicomponent Reynolds-Averaged Navier--Stokes Modeling of Reshocked Richtmyer--Meshkov Instability-Induced Turbulent Mixing Using the Weighted Essentially Nonoscillatory Method | James Holloway Oleg Schilling |
| Matt Orians | Low Power Thermal Reactor for Deep Space Probes | John Foster |
| Lloyd Rhoads | Model Based Predictive Control of a High Temperature Gas Cooled Power Plant Coupled to a Hydrogen Production Facility | James Holloway |
| Bradley Sommers | Plasma Ignition in Underwater Gas Bubbles | John Foster |
| Eva Sunny | On-The-Fly Generation of Differential Resonance Scattering Probability Distribution Functions for Monte Carlo Codes | William Martin |
| Crystal Thrall | Alternative Wide-Band-Gap Materials for Gamma-Ray Spectroscopy | Zhong He |
| Hao Yang | Application of Digital ASIC Array System for Noise Analysis, Non-linearity Correction, Event Classification and Reconstruction | Zhong He |
| Ben Yee | Spectroscopic Investigation of a Repetitively-Pulsed Nanosecond Discharge | John Foster |
| Peng Zhang | Effects of Surface Roughness on Electrical Contact, RF Heating and Field Enhancement | Y.Y. Lau |

Theses in Progress September 2012-August 2013

| Name | Thesis Title | Advisor |
|-------------------------|--|----------------------------------|
| Blake Kelley | The Derivation and Analysis of a Consistent 2D-1D Approximation to the 3D Linear Boltzmann Equation for Applications within a Parallel Simulator for Reactor Core Neutronics | Edward Larsen Thomas Downar |
| Anne Campbell | The Mechanism of Proton Irradiation-Induced Creep in Ultra-Fine Grain Graphite | Gary Was |
| Timothy Drzewiecki | Adjoint Based Uncertainty Quantification and Sensitivity Analysis for Nuclear Thermal-Fluids Codes | Thomas Downar Annalisa Manera |
| Douglas Fynan | Uncertainty Quantification for Reactor Safety Analysis | John C. Lee |
| Efrain Hernandez-Rivera | Deterministic-Monte Carlo Hybrid Model for Ion Irradiation Induced Microstructural Changes and Nano-Porous Structuring | Lumin Wang |
| Adam Nelson | Improved Convergence Rate of Multi-Group Scattering Moments Tallied by Monte Carlo | William Martin |
| Ian Rittersdorf | Effects of Random Manufacturing Errors on the Performance of Contemporary Coherent Radiation Sources | Y.Y. Lau |
| Will Schumaker | Pump-probe Applications of Laser Wakefield Acceleration | Karl Krushelnick |
| Sang-Heon Song | Control of the Electron and Ion Energy Distribution in the Low Temperature Plasmas for the Nanotechnology Application | Mark Kushner |
| Bryan Toth | Prediction and Analysis of Convergence for Monte Carlo Source Iterations | William Martin |
| Travis Trahan | An Asymptotic, Homogenized, Anisotropic Neutron Diffusion Approximation | Edward Larsen |
| Zachary Whetstone | Designing and Implementing a Variable Energy Neutron Beam to Search for Conventional Explosives | Kimberlee Kearfott |
| Cheng Xu | Irradiation Creep Mechanism Behind Primary Creep of Ferritic-Martensitic Steel T91 | Gary Was |
| Calvin Zulick | The Generation of Radiation Through Ultra-Intense Laser-Plasma Interactions | Karl Krushelnick |

FALL ENROLLMENT

| Year | Undergraduate | Graduate | Engineering Physics |
|------|---------------|----------|---------------------|
| 1980 | 68 | 88 | 0 |
| 1981 | 69 | 75 | 8 |
| 1982 | 51 | 84 | 16 |
| 1983 | 53 | 90 | 25 |
| 1984 | 46 | 78 | 29 |
| 1985 | 38 | 81 | 38 |
| 1986 | 45 | 89 | 33 |
| 1987 | 43 | 98 | 29 |
| 1988 | 38 | 103 | 27 |
| 1989 | 32 | 93 | 23 |
| 1990 | 31 | 97 | 21 |
| 1991 | 30 | 84 | 25 |
| 1992 | 44 | 94 | 20 |
| 1993 | 53 | 88 | 32 |
| 1994 | 44 | 82 | 33 |
| 1995 | 30 | 79 | 45 |
| 1996 | 26 | 78 | 41 |
| 1997 | 26 | 86 | 30 |
| 1998 | 28 | 79 | 35 |
| 1999 | 40 | 75 | 40 |
| 2000 | 38 | 75 | 34 |
| 2001 | 42 | 71 | 36 |
| 2002 | 47 | 61 | 31 |
| 2003 | 67 | 78 | 22 |
| 2004 | 72 | 84 | 24 |
| 2005 | 74 | 78 | 16 |
| 2006 | 76 | 77 | 22 |
| 2007 | 99 | 82 | 25 |
| 2008 | 111 | 100 | 18 |
| 2009 | 117 | 108 | 31 |
| 2010 | 121 | 124 | 42 |
| 2011 | 115 | 135 | 35 |
| 2012 | 106 | 115 | 31 |



EMPLOYMENT STATISTICS AND CONTINUING EDUCATION

Place of First Employment of Graduates September 2012- August 2013

UNDERGRADUATE STUDENTS

| EMPLOYER | BSE STUDENTS |
|-----------------------------|---------------------|
| Capgemini | Andrew Winters |
| DC Cook Power Plant | Guy Packard |
| Galt LLC | Philip Coyne |
| Makerbot | Alyssa Coligado |
| Norfolk Naval Shipyard | Theresa Willson |
| Schlumberger | Jason von Her |
| Susquehanna Nuclear Station | Shane Jurek |
| United States Air Force | Olivia Banks |
| United States Navy | Zachary Ballert |
| | Brett Hasson |
| | John Schmitz |
| | Jeanne Van Gilder |
| Unknown | Sandra Kame Domgíua |
| | Justin Dorazio |
| | Catherine Mussi |
| | Michael Brown |
| | Evan Demilner |
| | Qiaochu Li |
| | Brian Soble |
| | Darren Lim |
| | Joshua Ruggles |

| UNIVERSITY | BSE STUDENTS |
|-------------------------------|---------------------|
| Clemson University | Mara Watson |
| Cornell University | Shen Wang |
| Duke University | Carl Stanhope |
| MIT | Joowon Kwak |
| Pennsylvania State University | Jun Shi |
| University of Michigan, AOSS | Molly Flynn |
| University of Michigan, BME | Radha Arghal |
| University of Michigan, EECS | Ethan Stark |
| University of Michigan, ME | Lauren Mancía |
| University of Michigan, NERS | Benjamin Baumgarten |
| | Steven Exelby |
| | Yuan Gao |

| UNIVERSITY | BSE STUDENTS |
|------------------------------|-----------------------|
| University of Michigan, NERS | Aaron Graham |
| | Michael Jarrett |
| | Drew Johnson |
| | Brandon LaFleur |
| | Cameron Miller |
| | Alexandra Niska-Burja |
| | Sean O'Neal |
| | Scott Richards |
| | Gerrit Vancoevering |
| | Eric Welch |
| | Jacquelyn Wojewoda |
| University of Rochester | Alison Christopherson |
| University of Wisconsin | Matthew Scarpelli |
| Wayne State University | Eleanor Pryser |
| Other Graduate Schools | Wenxuan Fan |
| | Joshua Herzog |
| | Justin Herter |
| | Derek Laroque |
| | Linyu Lin |

GRADUATE STUDENTS

| EMPLOYER | MS/MSE STUDENTS |
|----------------------------------|------------------------|
| AREVA TN | Ayesha Athar |
| Argonne National Laboratory | Adam Kraus |
| General Electric Power and Water | Dana Miranda |
| Holtec | Robert Tinker |
| Ingenieur de L'Armement | Martin Farlotti |
| Knolls Atomic Power Laboratory | Colin Nordman |
| University of Michigan, NERS | Leonardi Tjayadi |
| Unknown | Daniel Chudnow |
| | Tyler deVries-Wallace |
| Westinghouse | Adam Schutt |
| US Navy NUPOC | Brice Taylor |

| EMPLOYER | PHD STUDENTS |
|--|-------------------------|
| Aerospace Corporation | Aimee Hubble |
| General Dynamics, Electric Boat | Lloyd Rhoads |
| H3D, Inc. | Jason Jaworski |
| National Nuclear Security Administration | Jennifer Dolan |
| | J. Tiberius Moran-Lopez |
| Oak Ridge National Laboratory | Eva Sunny |
| TBD | Crystal Thrall |
| Toshiba | Hao Yang |
| University of Michigan NERS, Post-Doc | Yvan Boucher |

| EMPLOYER | PHD STUDENTS |
|---|---------------------|
| | Geehyun Kim |
| University of Michigan NERS, Post-Doc | Brendan Kochunas |
| | Bradley Sommers |
| | Ben Yee |
| University of Michigan NERS, Research Scientist | Peng Zhang |

| UNIVERSITY (CONTINUING PHD) | MS/MSE STUDENTS |
|------------------------------------|------------------------|
| University of Michigan, NERS | Neil Arthur |
| | Elizabeth Beckett |
| | Akshay Dave |
| | Jeffrey Fein |
| | Geoffrey Greening |
| | Timothy Grunloh |
| | Andrew Hall |
| | Alexis Kaplan |
| | William Koehler |
| | Changyuan Liu |
| | Marc Paff |
| | Stephen Raiman |
| | Michael Rose |
| | David Simon |
| | Daniel Walter |

INTERNSHIPS

Undergraduate

| STUDENT | EMPLOYER | LOCATION |
|-----------------------|--|----------|
| Brandon LaFleur | Argonne National Laboratory | IL |
| Dylan Rittman | Argonne National Laboratory | IL |
| Daniel Nunez | Bechtel Power Corp | MD |
| Erich Rasch | Bobier Metrology Solutions | MI |
| Evan Demilner | Bochun University Research Experience | Germany |
| Nicholas Geil | Bradesoft | MI |
| David Cinquegrani | Brookhaven National Laboratory | NY |
| Cole Kushner | Chinese Academy of Sciences (NAOC) | China |
| Drew Johnson | Conagra | NE |
| Gretchen Mitschelen | DC Cook Power Plant | MI |
| Marcus Quinlan | DENSO Automotive | MI |
| William Irwin | DTE Fermi 2 Plant | MI |
| Matthew Neumann | DTE Fermi 2 Plant | MI |
| Ryan Leon | DTE Fermi 2 Plant | MI |
| Adam Singer | Element Materials Technology | MI |
| Sheldon Eng | GC Eng and Associates | NY |
| Kirk Liberty | L-3 Communications | PA |
| David Goodman | Los Alamos National Laboratory | NM |
| Dylan Rittman | Los Alamos National Laboratory | NM |
| Matthew Scarpelli | MA General Hospital (Proton Therapy) | MD |
| Cole Kushner | National Astronomical Observatory of China | China |
| Theresa Willson | Norfolk Naval Shipyard | VA |
| Bryan Evers | Nuclear Regulatory Commission | IL |
| Alexandra Niska Burja | Nuclear Regulatory Commission | IL |
| Scott Richards | Oak Ridge National Laboratory | TN |
| Sean Gray | Oak Ridge National Laboratory | TN |
| Shane Jurek | Oak Ridge National Laboratory | TN |
| Jason von Ehr | Schlumberger | MD |
| Neil Herman | SNERDI | China |
| Jun Shi | State Nuclear Company | France |
| Mason Taylor | Study Abroad | China |
| Trevor Olsen | Study Abroad | France |
| Andrew Fitzgerald | Study Abroad – SJTU | China |
| Jesse Bradfield | Study Abroad – SJTU | China |
| Stephanie Miller | Study Abroad – SJTU and SNERDI | China |
| Sylvia Domanico | Study Abroad – Xiamen and SNERDI | China |
| Tarek Ghaddar | Texas A&M University | TX |
| Nicholas Thiros | University of Chicago, Economics | IL |
| Mitchell Worner | University of Michigan, Astronomy (Vallun) | MI |
| Abu-Bakr Samory | University of Michigan, CAEN | MI |
| Andrew Gahan | University of Michigan, CAEN | MI |

| STUDENT | EMPLOYER | LOCATION |
|-----------------------|---|-----------------|
| Teresa Tombelli | University of Michigan, ME | MI |
| Karl Stimmel | University of Michigan, ME (Borgnakke) | MI |
| Nicholas Finan | University of Michigan, NERS (He) | MI |
| Gerrit Vancoevering | University of Michigan, NERS (Manera) | MI |
| Nishant Patel | University of Michigan, NERS (Martin) | MI |
| Steven Czyz | University of Michigan, NERS (Martin and Flaska) | MI |
| Eric Welch | University of Michigan, NERS (Thomas and Lee) | MI |
| Michael Mills | University of Michigan, Physics | MI |
| Anthony Riggins | University of Michigan, Physics | MI |
| Ethan Stark | University of Michigan, Solid State Electronics Lab | MI |
| Adam Cowherd | University of Michigan, Space Physics Research Lab | MI |
| Evan Noon | University of Michigan, SURE Program | MI |
| Adam Berkovec | University of Michigan, SURE Program (NERS) | MI |
| Anthony Bui | University of Michigan, SURE Program (NERS) | MI |
| Selman Mujovic | University of Michigan, SURE Program (NERS) | MI |
| Tony Shin | University of Michigan, SURE Program (NERS) | MI |
| Haining Zhou | University of Michigan, SURE Program (NERS) | MI |
| Kevin Xu | University of Michigan, SURE Program (NERS) | MI |
| Marisa Leney | University of Michigan, SURE Program (NERS) | MI |
| Matthew Scarpelli | University of Michigan, SURE Program (NERS) | MI |
| Charles Matrosic | University of Michigan Hospital, Radiation Oncology | MI |
| Vincent Grzywacz | University of Michigan Hospital, Radiation Oncology | MI |
| Daniel Polan | University of Michigan Hospital, Radiation Oncology | MI |
| Lauren Edson | University of New South Wales | Australia |
| Alison Christopherson | University of Rochester | NY |
| Rachel Bielajew | University of Washington | WA |
| Jonathan Buday | US Navy | |
| Aaron Graham | Westinghouse | PA |
| Jacquelyn Wojewoda | Westinghouse | PA |
| Morris Cramer | Xiamen University and US Navy | |

Graduate

| | |
|---|---------------|
| European Commission Joint Research Centre | Marc Paff |
| Idaho National Laboratory, Battelle Energy Alliance | Michael Rose |
| Los Alamos National Laboratory | Timothy Burke |
| Westinghouse Electric Company | Aaron Graham |

EMPLOYMENT PATTERNS OF GRADUATES

New Graduates: September 2012 – August 2013

| | BS | MS/MSE | PhD |
|---|----|--------|-----|
| Federal Government | | | |
| Department of Defense | | | |
| Norfolk Naval Shipyard | 1 | | |
| US Air Force | 1 | | 1 |
| US Navy | 4 | | |
| Department of Energy | | | |
| Argonne National Laboratory | | 1 | |
| Knolls Atomic Power Laboratory | | 1 | |
| Oak Ridge National Laboratory | | | 1 |
| National Nuclear Security Administration | | | 2 |
| Nuclear Regulatory Commission | | | |
| Electrical and Nuclear Utilities | | | |
| AREVA | | 1 | |
| DC Cook Power Plant | 1 | | |
| Susquehanna Nuclear Station | 1 | | |
| Westinghouse | | 1 | |
| Nuclear Reactor Manufacturers | | | |
| Bechtel | | 2 | |
| General Electric | 1 | | |
| Consulting Firms | | | |
| Capgemini | 1 | | |
| Entrepreneurial | | | |
| H3D | | | 1 |
| Other Industrial and Medical Organizations | | | |
| Aerospace Corporation | | | 1 |
| Holtec | | 1 | |
| General Dynamics, Electric Boat | | | 1 |
| Schlumberger | 1 | | |
| Toshiba | | | 1 |
| TerraPower | | | 1 |
| Foreign Governments | | | |
| Academic Institution: Grad, Post Doc, and Faculty | | | |
| International Atomic Energy Agency | | | |
| Military | | | |
| Academic Institutions: Grad, Post Doc, and Faculty | | | |
| Clemson University | 1 | | |
| Cornell University | 1 | | |
| Duke University | 1 | | |
| MIT | 1 | | |

| | | | |
|---|----|----|----|
| Pennsylvania State University | 1 | | |
| University of Michigan, AOSS | 1 | | |
| University of Michigan, AERO | 1 | | |
| University of Michigan, BME | 1 | | |
| University of Michigan, EECS | 1 | | |
| University of Michigan, ME | 1 | | |
| University of Michigan, NERS | 14 | 16 | 6 |
| University of Rochester | 1 | | |
| University of Wisconsin | 1 | | |
| Wayne State University | 1 | | |
| Unknown Graduate Schools | 5 | | |
| Other | | 1 | |
| Employment Outside the Profession | 2 | | |
| Returned to Home Country and Unknown | 9 | 2 | 2 |
| TOTALS | 52 | 26 | 16 |

43-Year Summary: September 1970 – August 2013

| | BS | MS | M ENG | PhD | Pro |
|---|-----|-----|-------|-----|-----|
| Federal Government | | | | | |
| Armed Forces | 73 | 23 | 1 | 8 | |
| Civilian Employees | 7 | 3 | | 17 | |
| Department of Commerce | | | | 7 | |
| Department of Defense | | 1 | | | |
| Department of Energy | 12 | 55 | 4 | 117 | |
| Department of Transportation | | | | 2 | |
| Environmental Protection Agency | | | 2 | | |
| NASA | | 1 | | | |
| Nuclear Regulatory Commission | 1 | 6 | 1 | | 1 |
| Waste Management Federal Services | | 1 | | | |
| Electrical and Nuclear Utilities | 92 | 49 | 1 | 9 | |
| Nuclear Reactor Manufacturers | 45 | 53 | | 21 | 1 |
| Architecture-Engineering Firms | 19 | 29 | 1 | 5 | |
| Consulting Firms | 11 | 7 | 6 | 12 | |
| Entrepreneurial | 2 | | | 1 | |
| Other Industrial and Medical Organizations | 35 | 53 | 5 | 66 | |
| Foreign Governments | 1 | 20 | 3 | 15 | 4 |
| Academic Institutions | | | | | |
| Faculty and Staff | 7 | 11 | 2 | 63 | |
| Graduate Schools and Post Doctorate Work | 513 | 428 | 10 | 58 | |
| Employment Outside the Profession | 21 | 11 | | 2 | |
| Returned to Home Country and Unknown | 128 | 50 | 7 | 34 | 3 |
| Fulbright Award | 1 | | | | |
| TOTALS | 967 | 795 | 42 | 432 | 9 |

| DATE | SPEAKER | TITLE |
|----------|---|--|
| Sept. 14 | Ron Gilgenbach University of Michigan, NERS | Department Welcome |
| Sept. 21 | Michael Corradini University of Wisconsin | Nuclear Power After Fukushima |
| Sept. 28 | Richard Kouzes Pacific Northwest National Laboratory | The End of ^3He As We Know It? |
| Oct. 5 | Keun Bae Oh KAERI | Korean Nuclear Energy Development and Cooperation Between the U.S. and Korea |
| Oct. 12 | John Booske University of Wisconsin | Back to the Future: 21 st Century Instruction Innovations (Alumni Society Merit Award – Joint Seminar with MIPSE) |
| Oct. 19 | No Colloquium | Career Fair |
| Oct. 26 | Emily Wolters Argonne National Laboratory | Advanced Neutronics Analysis Tools at Argonne National Laboratory |
| Nov. 2 | Basar Ozar Fauske & Associates | Investigation of Hydrodynamic Loads Associated with Pyrotechnic Valve Actuation Criticality Analysis |
| Nov. 9 | Dale Lancaster NuclearConsultants.com | Advances in Spent Fuel Pool Criticality Analysis |
| Nov. 16 | Paul Drake UM, AOSS | The Latest on the Quest for Fusion at the National Ignition Facility |
| Nov. 23 | No Colloquium | Thanksgiving Recess |
| Nov. 30 | James Duderstadt UM President Emeritus | Lessons Learned from a Half Century of Battles in the Nuclear Power Wars (Richard K. Osborn Lecture) |
| Dec. 7 | Michael Podowski Rensselaer Polytechnic Institute | Toward the Development of a Virtual Reactor: Modeling and Computational Issues in Multiphase Flow and Heat Transfer |

| DATE | SPEAKER | TITLE |
|---------|--|---|
| Jan. 18 | David Poston Los Alamos National Laboratory | Topic: The DUFF Experiment at the Nevada Test Site |
| Jan. 25 | Aaron Pierce UM, Physics | The Standard Model of Particle Physics, and Why the Higgs Particle Matters |
| Feb. 8 | Steve Tobin Los Alamos National Laboratory | Improving Nondestructive Assay Technology for Spent Nuclear Fuel—Highlights from the Next Generation Safeguards Initiative Spent Fuel Project |
| Feb. 15 | Brian Kendrick Los Alamos National Laboratory | High Resolution Modeling of CRUD Deposition on Nuclear Fuel Rods |
| Feb. 22 | Cari Siefert Pacific Northwest National Laboratory | A Detector Geek's Perspective on the Comprehensive Nuclear Test Ban Treaty |
| Mar. 1 | NERS PhD Student Presentations | Sang-Heon Song (Kushner), Christopher Lawrence (Pozzi), Yuxuan Liu (Martin) |
| Mar. 8 | No Colloquium | Winter Break |
| Mar. 15 | Annalisa Manera UM, NERS | Computational Fluid Dynamics in Nuclear Engineering and the Need for CFD-Grade Experiments |
| Mar. 22 | Alexander Thomas UM, NERS | The Power of Light: Next Generation Radiation Sources Enabled by Ultra-Powerful Lasers Interacting with Plasma |
| Apr. 5 | Tony Bird University of Southampton, England | The INTEGRAL Space Observatory – 10 Years in Orbit |
| Apr. 12 | Xiaodong Sun Ohio University | Two-Phase Flow Experimentation and CFD Computation at OSU Thermal Hydraulics Laboratory |
| Apr. 19 | Miklos Porkolab Massachusetts Institute of Technology | Worldwide Progress Toward Realizing Nuclear Fusion Energy |

Research Activities

FISSION SYSTEMS AND RADIATION TRANSPORT

“PARCS Code Development for LWR”

PI: Thomas Downar

Sponsor: Nuclear Regulatory Commission

\$440,000/2012

“HTR Development of PARCS Code”

PI: Thomas Downar

Sponsor: Nuclear Regulatory Commission

\$294,000/2012

“HTR Methods Development”

PI: Thomas Downar

Sponsor: Department of Energy, Nuclear Engineering University Program (NEUP)

\$220,000/2012

“RBWR Transient Analysis”

PI: Thomas Downar

Sponsor: Department of Energy, Nuclear Engineering University Program (NEUP)

\$93,000/2012

“RBWR Thorium Fuel Cycle”

PI: Thomas Downar

Sponsor: Department of Energy, Nuclear Engineering University Program (NEUP)

\$90,000/2012

“Multiphysics Code Integration (VRI)”

PI: Thomas Downar

Sponsor: CASL

\$140,000/2012

“Transport Methods (RTM)”

PI: Thomas Downar

Sponsor: CASL

\$190,000/2012

“Multi-scale Multi-physics Methods Development for the Calculation of Hot-spots in the NGNP”

PI: Thomas Downar, Co-PI: William Martin

Sponsor: Department of Energy, NEUP

\$447,000; 10/01/2009 – 09/30/2012

“Accident Tolerant Fuel”

Co-PI: Thomas Downar

Sponsor: Department of Energy, IRP

\$90,000; 2012

“Inherently Safe LWR”

Co-PI: Thomas Downar

Sponsor: Department of Energy, IRP

\$94,000; 2012

“Hybrid Monte Carlo/Deterministic Radiation Transport Simulations for Source-Detector Problems”

PI: Edward Larsen

Sponsor: Department of Energy

\$320,000; 9/1/2009 – 8/31/2012

The technical goal of this project is to develop and implement new hybrid Monte Carlo/Deterministic methods in the commercial ATTILA (neutron/photon) transport code, so that this code can better simulate radiation detection problems of interest for homeland security problems. No publications from this project were published in 2012. However, a conference paper will appear in 2013.

“A New 2D-Transport 1D-Diffusion Approximation of the Boltzmann Transport Equation”

PI: Edward Larsen, Co-PI: Thomas Downar

Sponsor: Department of Energy

\$391,000; 10/2009 – 9/2012

The technical goals of this project are to develop (i) an improved theoretical understanding of the current 2D/1D method in the DeCART code, which is employed for the simulation of 3D reactor cores, and (ii) to develop and implement an improved version of this method that will enable DeCART to consistently simulate realistic 3-D neutron transport problems. Two publications from this project were published in 2012, both coauthored with NERS PhD student Blake Kelley.

“The Suppression of Energy Discretization Errors in Multigroup Transport Calculations”

PI: Edward Larsen, Co-PI: William Martin

Sponsor: Department of Energy

\$483,000; 10/2009 – 9/2012

The technical goal of this project is to develop an efficient numerical algorithm for performing multigroup discrete ordinates calculations for multigroup problems containing thousands of energy groups. We are pursuing this goal by applying multigrid techniques, which were developed in the mathematical community for elliptic problems.

“Realistic Nuclear Plant Safety Analysis Representing System Degradation”

PI: John Lee

Sponsor: Korea Atomic Energy Research Institute

\$210,000; 3/1/2012 – 2/28/2015

D.A. Fynan, K.-I Ahn, H.-G. Lim, and J.C. Lee, “Uncertainty Quantification of LBLOCA PCT for a Pressurized Water Reactor by ACE Algorithm and Gaussian Process Model,” *Proc. 18th Pacific Basin Nuclear Conference*, Busan, Korea (2012).

“Multi-Scale Thermal-Hydraulic Tool for Nuclear Power Plant Safety Analyses”

PI: Annalisa Manera

Sponsor: Nuclear Regulatory Commission

\$252,269; 09/2012 – 03/2015

“Thermal Cycling Model Review and Recommendations”

PI: Annalisa Manera

Sponsor: Electric Power Research Institute

\$13,220; 03/2012 – 12/2012

“Implementation of On-the-Fly Doppler Broadening in MCNP5 for Multiphysics Simulation of Nuclear Reactors”

PI: William Martin, Co-PI: John Lee

Sponsor: Department of Energy, Nuclear Engineering University Program (NEUP)

\$203,000/year; 7/29/2010 – 7/29/2012

G. Yesilyurt and W.R. Martin, “On-the-Fly Doppler Broadening for Monte Carlo Codes,” accepted for publication in *Nuclear Science and Engineering* (2011).

“CASL – Energy Innovation Hub for Nuclear Energy Modeling and Simulation”

PI: William Martin, Co-PI: Thomas Downar, Ed Larsen, John Lee, Annalisa Manera, Gary Was

Sponsor: Department of Energy, Subcontract through ORNL

\$1,700,000/year; 7/1/2010 – 6/30/2015

A.J. Hoffman and J.C. Lee, "A Variable-Order Time-Dependent Neutron Transport Method for Nuclear Reactor Kinetics Using Analytically-Integrated Space-Time Characteristics," submitted for presentation at the M&C Conference, May 2013

A.J. Hoffman and J.C. Lee, "Low-Order Approximations to the Angular Flux Time Derivative for Transport-based Reactor Kinetics," submitted for presentation at the ANS Conference, June 2013.

W.R. Martin, "Challenges and Prospects for Whole-Core Monte Carlo Analysis," *Nucl. Eng. Tech.* 44, March 2012.

MATERIALS

“Evaluation of Materials for Interim Storage of Used Fuel for More than 100 Years”

PI: Lumin Wang

Sponsor: Department of Energy, Nuclear Engineering University Program (NEUP)

\$931,603; 9/1/2010 – 8/31/2013

“Training of Chinese Visiting Scholars and Laboratory Use at University of Michigan”

PI: Lumin Wang

Sponsor: Xiamen University, China

\$50,000; 10/01/2012 – 09/30/2013

“Training of Chinese Visiting Scholars and Laboratory Use at University of Michigan”

PI: Lumin Wang

Sponsor: Beijing University of Science and Technology, China

\$26,500; 10/01/2012 – 09/30/2013

“Localized Deformation and Intergranular Fracture of Irradiated Alloys under Extreme Environmental Conditions”

PI: Gary Was

Sponsor: Department of Energy, Basic Energy Sciences

\$844,000; 3 years

“Cladding and Materials for Advanced Nuclear Energy Systems”

PI: Gary Was

Sponsor: EPRI

\$600,000; 3 years

“Identifying Mechanisms and Mitigation Strategies for Irradiation Assisted Stress Corrosion Cracking of Austenitic Steels in LWR Core Components”

PI: Gary Was

Sponsor: Department of Energy, EPRI

\$2,400,000; 5 years

“Potential for Atom Probe Tomography in Understanding IASCC”

PI: Gary Was, Co-PI: Z. Jiao

Sponsor: Electric Power Research Institute (EPRI)

\$253,000; 2.5 years

Irradiation assisted stress corrosion cracking (IASCC) refers to intergranular stress corrosion cracking (IGSCC) that is enhanced or accelerated by irradiation over the unirradiated state in light water reactor core components. IASCC has been a problem in the nuclear industry for over 30 years. It is the primary form of core component cracking in boiling water reactors (BWR). It is also an issue of growing importance in pressurized water reactors (PWR). It is probably the most severe potential problem in the supercritical water reactor concept of the DOE Generation IV program. An understanding of the mechanism of IASCC is required in order to provide guidance for the development of mitigation strategies in all these reactors

Conventional tools such as SEM, TEM, AES, etc. have proved very useful in studying IASCC mechanism within their limitations. Atom probe field-ion microscope (AP-FIM) was proposed in the study of the interaction of impurity atoms with defects in the late 1970's. Since then, atom probe has emerged as a complementary tool in studying nuclear structural materials, especially in the field of radiation induced segregation (RIS). Early atom probes are very limited by their design and data collection and processing power. In recent years, atom probes have been improved significantly. Data collection and processing are no longer a bottleneck with modern computers. A large volume of atoms on the order of 10^5 nm^3 can be analyzed in a significantly short time. The application of atom probe as a complementary tool in the study of IASCC mechanism becomes more practical and important.

The objective of this project is to explore the potential of atom probe tomography (APT) as a tool for understanding the mechanism of irradiation assisted stress corrosion cracking of austenitic alloys in light water reactor core components.

“Crack-tip Mechanisms Driving Environmental Degradation”

PI: Gary Was

Sponsor: Department of Energy, Basic Energy Sciences

\$1,500,000 (\$527,000 to UM); 4 years

“Corrosion and Creep of Candidate Alloys in High Temperature He and Steam Environments”

PI: Gary Was

Sponsor: Department of Energy, Nuclear Energy University Programs

\$747,500; 3 years

“Aging and Embrittlement of High Fluence Stainless Steel”

PI: Gary Was, Co-PI: Z. Jiao

Sponsor: NNSA

\$500,000; 2 years

“Mitigation Strategies for IASCC Using PIA”

PI: Gary Was, Co-PI: Zhijie Jiao

Sponsor: Electric Power Research Institute

\$400,000; 4 years

“Localized Deformation and IASCC”

PI: Gary Was, Co-PI: Zhijie Jiao
Sponsor: Electric Power Research Institute
\$280,000; 3 years

“Factor of Improvement in IGSCC of Alloy 690 over Alloy 600”

PI: Gary Was, Co-PI: Zhijie Jiao
Sponsor: Electric Power Research Institute
\$260,000; 3 years

“Acquisition of a 3 MV Accelerator for Radiation Damage Studies”

PI: Gary Was
Sponsor: Department of Energy, NEUP
\$900,000; 2.5 years

“Irradiation Accelerated Corrosion”

PI: Gary Was
Sponsor: Department of Energy, NEUP, MAI
\$1,600,000; 3 years

“Structural Materials for Fast Reactors”

PI: Gary Was
Sponsor: Department of Energy, NEUP
\$1,100,000; 3 years

“Heavy Ion Irradiation of HTP”

PI: Gary Was
Sponsor: TerraPower
\$900,000; 3 years

“Characterization and Modeling of Grain Boundary”

Co-PI: Gary Was
Sponsor: Department of Energy, NEUP
\$1,000,000; 3 years

PLASMAS AND FUSION

“An investigation of plasma formation in electromechanically driven free bubbles at resonance in water with applications for the treatment of contaminated water”

PI: John Foster

Sponsor: National Science Foundation

\$288,000; 9/1/2010 – 8/31/2014

Sponsor: National Science Foundation, REU Supplement

\$6810; 5/1/2011 – 4/30/2014

“Blackout Mitigation Via Cathode Spot Ejection of Ceramic Quenchant Particulate”

PI: John Foster

Sponsor: NASA

\$30,000; 5/1/2011 – 4/30/2012

“High Power High Thrust Ion Thruster”

PI: John Foster

Sponsor: NASA, EDA

\$199,681; 4/25/2011 – 8/24/2013

“Water Purification by High Voltage, Nanosecond Plasma”

PI: John Foster

Sponsor: NASA

\$2000; 8/27/2010 – 12/31/2012

“Water Vapor Plasma Gun Methodology for Dust Mitigation Supporting Astronaut Surface Operations”

PI: John Foster

Sponsor: NASA

\$99,557; 09/01/2012 – 08/31/2013

“Non-intrusive Measurement of Electric Field in Pulsed Nanosecond Discharge for Plasma-aided Combustion”

PI: John Foster

Sponsor: NASA

\$90,000; 6/8/2009 – 6/8/2012

“Annular Geometry Ion Engine Discharge Chamber Analysis”

PI: John Foster

Sponsor: NASA, Aerojet Corporation

\$147,429; 10/1/2011 – 9/30/2012

“Advanced space water purification and recycling using nonthermal plasmas”

PI: John Foster

Sponsor: NASA

\$99,767; 9/1/2012 – 8/31/2013

“Towards plasma purification of wastewater via and underwater DBD”

PI: John Foster

Sponsor: WERF

\$100,000; 1/1/2012 – 12/31/2013

“Theoretical and Experimental Investigation of Microwave Plasma Streamers: Structures and Control”

PI: Natalia Babaeva (EECS), Co-PI: John Foster

\$583,259; 5/1/2012 – 4/30/2015

“Water purification by high voltage, nanosecond plasma – Phase II”

PI: Isaiah Blankson (NASA), Co-PI: John Foster

Sponsor: NASA

\$40,000; 4/15/2012 – 9/30/2013

“Investigation of High Pressure Plasmas for Treatment of Porous Materials”

PI: Mark Kushner, Co-PI: John Foster

Sponsor: 3M

\$145,000; 12/1/2009 – 12/1/2012

“A Fusion Hybrid Reactor for Safe Large Power Production”

PI: Terry Kammash, Co-PI: John Foster

Sponsor: TransPower Inc

\$993,839; 9/1/2012 – 8/31/2015

“Point-of-use water purification system based on direct plasma injection for astronaut water recovery and management”

PI: John Foster

Sponsor: NASA

\$99,767; 9/1/2012 – 8/31/2013

“Recyclable transmission line experiments on a linear transformer driver”

PI: Ron Gilgenbach, Co-PI: Y.Y. Lau, David Chalenski

Sponsor: Sandia National Laboratory

\$243,000; 4/1/2011 – 7/30/2014

“Ultra-Short Pulse Laser for Advanced Cathodes and Windows for High Power Microwave Sources”

PI: Ron Gilgenbach, Co-PI: John Foster

Sponsor: Air Force Office of Scientific Research

\$149,962; 9/1/2010 – 8/31/2011

“Phase locking of COTS magnetrons”

PI: Ron Gilgenbach, Co-PI: Y.Y. Lau

Sponsor: Office of Naval Research/University of New Mexico

\$460,000; 7/16/2009 – 7/15/2012

This project studies mode locking of high power microwave devices, in collaboration with the University of New Mexico.

D.H. Simon, Y.Y. Lau, J.W. Luginsland, R.M. Gilgenbach, “An unnoticed property of the cylindrical relativistic Brillouin flow,” *Phys. Plasmas* **19**, 043103 (2012).

M. Franzi, R.M. Gilgenbach, Y.Y. Lau, B. Hoff, G. Greening, and P. Zhang, “Passive mode control in recirculating magnetron,” *Phys. Plasmas* **20**, 033108 (2013).

M. Franzi, R.M. Gilgenbach, B.W. Hoff, D.A. Chalenski, D. Simon, Y.Y. Lau, and J.W. Luginsland, “Recirculating planar magnetron simulations and experiments,” *IEEE Trans. Plasma Sci.* (in press, 2013).

“Innovative Inverted Magnetron Experiment and Theory”

PI: Ron Gilgenbach, Co-PI: Y.Y. Lau, John Foster

Sponsor: AFOSR

\$1,685,538; 4/1/2010 – 2/28/15

D.H. Simon, Y.Y. Lau, J.W. Luginsland, R.M. Gilgenbach, “An unnoticed property of the cylindrical relativistic Brillouin flow,” *Phys. Plasmas* **19**, 043103 (2012).

M. Franzi, R.M. Gilgenbach, Y.Y. Lau, B. Hoff, G. Greening, and P. Zhang, “Passive mode control in recirculating magnetron,” *Phys. Plasmas* **20**, 033108 (2013).

M. Franzi, R.M. Gilgenbach, B.W. Hoff, D.A. Chalenski, D. Simon, Y.Y. Lau, and J.W. Luginsland, “Recirculating planar magnetron simulations and experiments,” *IEEE Trans. Plasma Sci.* (in press, 2013).

“Basic Studies of Distributed Discharge Limiters for Counter-HPM”

PI: Ron Gilgenbach, Co-PI: Y.Y. Lau

Sponsor: AFOSR Prime

\$950,000; 3/1/2009 – 2/28/14

K.L. Jensen, J. Lebowitz, Y.Y. Lau, J. Luginsland, “Space charge and quantum effects on electron emission,” *J. Appl. Phys.* 111, 054917 (2012).

D. Chernin, I. Rittersdorf, Y.Y. Lau, T.A. Antonsen, B. Levush, “Effects of multiple internal reflections on the small signal gain and phase of a TWT,” *IEEE Trans. Electron Devices* **59**, 1542 (2012).

P. Zhang, Y.Y. Lau, R.S. Timsit, “On the spreading resistance of thin film contacts,” *IEEE Trans. Electron Devices* **59**, 1936 (2012).

P. Zhang, D.M.H. Hung, and Y.Y. Lau, “Current flow in a 3-terminal thin film contact with dissimilar materials and general geometric aspect ratios,” *J. Phys. D: Appl. Phys.* **46**, 065502 (2013).

P. Zhang and Y.Y. Lau, “Constriction resistance and current crowding in vertical thin film contact,” *IEEE J. Electron Device Soc.* (accepted, 2013).

Y.B. Zhu, P. Zhang, A. Valfells, L.K. Ang, and Y.Y. Lau, “Novel scaling laws for the Langmuir-Blodgett solutions in cylindrical and spherical diodes,” *Phys. Rev. Lett.* (submitted, 2013).

“Diagnostics of an LTD Recyclable Transmission Line”

PI: Ron Gilgenbach, Co-PI: Y.Y. Lau

Sponsor: Department of Energy

“Active interrogation using radiation generated from intense laser produced electron beams”

PI: Karl Krushelnick

Sponsor: National Science Foundation, DNDO

\$1,835,000; 5 years

“Collaborative Research: Graduate Student Training through Research on Plasma-based Acceleration at Laser Power Up to 300 TW”

PI: Karl Krushelnick

Sponsor: National Science Foundation

375,000; 4 years

“Femtosecond Probing of Magnetic Fields Generated from Ultra-Intense Laser Plasma Interactions”

PI: Karl Krushelnick

Sponsor: National Science Foundation, Department of Energy

\$650,000; 4 years

“Intense Laser Interactions with Low Density Plasmas Using OMEGA EP”

PI: Karl Krushelnick

Sponsor: Department of Energy, NNSA

\$380,000; 2 years

“Generation of Miniature Hohlraum X-ray Sources Using Intense Lasers”

PI: Karl Krushelnick, Co-PI: Alec Thomas

Sponsor: Defense Threat Reduction Agency

\$1,760,000; 1/1/2011 – 12/31/2015

“Compact laser plasma source of spatially coherent x-rays”

PI: Karl Krushelnick, Co-PI: Alec Thomas

Sponsor: DARPA

\$4,100,000; 6/1/2011 – 5/31/2015

“Investigation of Laser-Based Thomson Scattering”

Co-PI: Karl Krushelnick

Sponsor: ARO

\$450,000; 4 years

“Modern Optics in the City of Light, a Collaborative REU Site in Paris”

Co-PI: Karl Krushelnick

Sponsor: NSF

\$396,955; 3 years

“Incoherent Fiber-laser array pumped high power OPCPA laser plasma accelerator drive”

Co-PI: Karl Krushelnick

Sponsor: DOE/SBIR

\$100,000; 2 years

“Theoretical and Experimental Studies of Magneto-Rayleigh-Taylor Instability”

PI: Y.Y. Lau, Co-PI: Ron Gilgenbach

Sponsor: Department of Energy

\$445,000; 8/15/2009 – 3/14/2013

Sponsor: National Science Foundation

\$15,000; 10/1/2009 – 9/30/2012

J.C. Zier, R.M. Gilgenbach, D.A. Chalenski, Y.Y. Lau, D.M. French, M.R. Gomez, S.G. Patel, I.M. Rittersdorf, A.M. Steiner, M. Weis, P. Zhang, M. Mazarakis, M.E. Cuneo, and M. Lopez, “Magneto-Rayleigh-Taylor experiments on a mega ampere linear transformer driver,” *Phys. Plasmas* **19**, 022703 (2012).

P. Zhang, Y.Y. Lau, I.M. Rittersdorf, M.R. Weis, R.M. Gilgenbach, D. Chalenski, and S.A. Slutz, "Effects of magnetic shear on the Magneto-Rayleigh-Taylor instability," *Phys. Plasmas* **19**, 022703 (2012).

"Advanced RF sources based on nonlinear transmission lines"

PI: Y.Y. Lau, Co-PI: Ron Gilgenbach

Sponsor: AFOSR

\$594,407; 7/1/2009 – 8/31/2014

K.L. Jensen, J. Lebowitz, Y.Y. Lau, and J. Luginsland, "Space charge and quantum effects on electron emission," *J. Appl. Phys.* **111**, (2012).

D. Chernin, I. Rittersdorf, Y.Y. Lau, T.A. Antonsen, and B. Levush, "Effects of multiple internal reflections on the small signal gain and phase of a TWT," *IEEE Trans. Electron Devices* **59**, 1542 (2012).

P. Zhang, Y.Y. Lau, and R.S. Timsit, "On the spreading resistance of thin film contacts," *IEEE Trans. Electron Devices* **59**, 1936 (2012).

P. Zhang, B. Hoff, Y.Y. Lau, D.M. French, and J.W. Luginsland, "Excitation of a slow wave structure," *Phys. Plasmas* **19**, 123104 (2012).

P. Zhang, D.M.H. Hung, and Y.Y. Lau, "Current flow in a 3-terminal thin film contact with dissimilar materials and general geometric aspect ratios," *J. Phys. D: Appl. Phys.* **46**, 065502 (2013).

S. Sengele, M.L. Barsanti, T.A. Hargrave, C.M. Armstrong, J.H. Booske, and Y.Y. Lau, "Impact of random manufacturing errors on back-wave small signal gain in traveling wave tubes with finite space charge electron beams," *J. Appl. Phys.*, vol. 113, 074905 (2013).

S. Sengele, M.L. Barsanti, T.A. Hargrave, C.M. Armstrong, J.H. Booske, and Y.Y. Lau, "Impact of random manufacturing errors on fundamental forward-wave small-signal gain and bandwidth in traveling wave tubes with finite space charge electron beams," *IEEE Trans. Electron Devices* (in the press, 2013).

P. Zhang and Y.Y. Lau, "Constriction resistance and current crowding in vertical thin film contact," *IEEE J. Electron Device Soc.* (accepted, 2013).

I.M. Rittersdorf, T.M. Antonsen, D. Chernin, and Y.Y. Lau, "Effects of Random Circuit Fabrication Errors on the Mean and Standard Deviation of Small Signal Gain and Phase of a Traveling Wave Tube," *IEEE J. Electron Device Soc.* (accepted, 2013).

Y.B. Zhu, P. Zhang, A. Valfells, L.K. Ang, and Y.Y. Lau, "Novel scaling laws for the Langmuir-Blodgett solutions in cylindrical and spherical diodes," *Phys. Rev. Lett.* (submitted, 2013).

"Non-Linear Optics in Plasmas at Ultra-High Intensities"

PI: Alec Thomas

Sponsor: National Science Foundation

\$500,000; 1/1/2010 – 12/31/2012

“CAREER: Bright femtosecond x- and y-ray pulse production using ultra intense lasers”

PI: Alec Thomas

Sponsor: National Science Foundation

\$450,000; 10/1/2011 – 9/31/2016

“AFOSR Young Investigator Program: Understanding intense laser interactions with solid density plasma”

PI: Alec Thomas

Sponsor: Department of Defense, Air Force

\$373,603; 10/1/2012 – 9/31/2017

“High Harmonic Radiation Generation and Attosecond Pulses from Intense Laser-Solid Interactions”

PI: Alec Thomas

Sponsor: National Science Foundation and Department of Energy

\$600,000; 10/1/2012 – 9/31/2015

RADIATION MEASUREMENTS AND IMAGING

“Digital 3-Dimensional Position-Sensitive Semiconductor Radiation Detectors”

PI: Zhong He

Sponsor: Department of Energy, NA-22

\$900,000; 5/1/2010 – 4/30/2013

This project will develop digital acquisition systems for room temperature CZT and alternative semiconductor gamma-ray spectrometers.

“Target-Linked Radiation Imaging (TLRI)”

PI: Zhong He

Sponsor: General Electric Company

\$517,279; 9/1/2009 – 7/13/2012

“Development of TlBr and InBr semiconductor gamma-ray spectrometers”

PI: Zhong He

Sponsor: Domestic Nuclear Detection Office, Radiation Monitoring Devices

\$190,000; 9/22/2008 – 1/31/2012

This project will develop TlBr semiconductor gamma-ray spectrometers as an alternative wide band-gap semiconductor radiation detector due to its high stopping power, wide band-gap, and potentially lower manufacturing cost.

“Development of Integrated Real-Time Imaging and Isotope Detection Algorithms for 3-Dimensional Position-Sensitive Semiconductor Gamma-Ray Imaging Spectrometers and Sensor Networks”

PI: Zhong He

Sponsor: National Science Foundation, DHS-DNDO

\$1,993,290; 9/1/2007 – 8/31/2012

The purpose of this project is to develop real-time gamma-ray imaging techniques and nuclear isotope detection algorithms for 3-D position-sensitive semiconductor imaging spectrometers and sensor networks.

“Development of High Resolution 3-Dimensional Position-Sensitive CdZnTe Gamma-Ray Spectrometers”

PI: Zhong He

Sponsor: Department of Energy, NA-22

\$1,649,998; 9/15/2006 – 9/14/2012

The purpose of this project is to develop room-temperature CZT semiconductor gamma-ray spectrometers, with energy resolution of better than 1% at 662keV.

“Detection of Shielded Uranium and Plutonium”

PI: Zhong He
Sponsor: Department of Defense, DTRA
\$460,713; 7/1/2011 – 3/27/2012
Subcontract from Alion Science and Technology

“Advance Room-Temperature 3-D Semiconductor Gamma-Ray Imaging Detectors (From Polaris to Orion)”

PI: Zhong He
Sponsor: Department of Defense, DTRA
\$3,440,781; 3/1/2012 – 2/28/2015

“Quantified understanding of polarization at room temperature of TlBr pixelated detectors”

PI: Zhong He
Sponsor: Department of Energy
\$114,996; 12/21/2012 – 7/31/2013
Subcontract from Lawrence Livermore National Laboratory

“Development of a lower-power digital ASIC for compact TlBr gamma-ray spectrometers”

PI: Zhong He
Sponsor: Department of Homeland Security, DNDO
\$40,000; 9/12/2012 – 3/20/2013

For more on Professor Zhong He’s group, see website at: <http://czt-lab.engin.umich.edu>

“Luminescent Self-reading Energy-sensitive Temporal Radiation Monitoring System (LuSEnT)”

PI: Kim Kearfott
Sponsor: University of Michigan College of Engineering and Office of Technology Transfer
\$32,000; 2012

“Training Future Imaging Scientists for Biomedicine

Co-PI: Kim Kearfott
Sponsor: National Institute of Health
\$1,124,960; 9/2008 – 8/2013

“Basic Physics Data: Improved Fission Neutron Data base for Active interrogation of Actinides”

PI: Sara Pozzi
Sponsor: Department of Energy, Office of Nuclear Energy, Nuclear Engineering University Program
\$690,000; 10/1/2009 – 9/30/2012

This three-year project proposes to build a team of four top universities and of one national laboratory to develop innovative neutron detection system for active interrogation measurements. Many active interrogation methods to detect fissionable material are based on the detection of neutrons from fission induced by fast neutrons or high-energy gamma rays. The energy spectrum of the fission neutrons provides data to identify the fissionable isotope(s) and materials such as shielding between the fissionable material and the detector. The challenges for making confident measurements are the detection of neutrons in the energy ranges of 0.01 – 1 MeV and above 8 MeV. These regions are also where the basic data on the neutron energy spectrum emitted from fission is the least well known. In addition, improvements in the specificity of neutron detectors are required throughout the complete energy range: they must be able to clearly distinguish neutrons from other radiations, in particular gamma rays and cosmic rays. We believe that all of these challenges can be addressed successfully with emerging technologies under development by this collaboration. In particular, the collaboration will address the area of fission neutron emission spectra for isotopes of interest in the advanced fuel cycle initiative.

“New Detectors, Electronics, and Algorithms for Fast Neutron Spectroscopy in a Scalable Measurement Platform”

PI: Sara Pozzi

Sponsor: Department of Homeland Security, Domestic Nuclear Detection Office, National Science Foundation

\$2,000,000; 5 years

In this project, novel neutron detection systems based on organic scintillators are being designed, evaluated, and delivered. The systems have the objective of preserving the incoming neutron energy information while maintaining high detection efficiency and allowing neutron/gamma ray discrimination. The information provided by this approach will (i) increase the sensitivity to shielded SNM and (ii) allow the system to differentiate among neutron sources of various types. The project is also helping to develop and train the much-needed next generation of nuclear scientists and engineers by engaging them in cutting-edge research activities.

“Digital Waveform Sampling of Neutron and Gamma Ray Signals from Scintillators, Stewardship Science Academic Alliance Program”

PI: Sara Pozzi, Co-PI: Marek Flaska, Shaun Clarke

Sponsor: Department of Energy, National Nuclear Security Administration

\$490,000; 3 years

The objective of the project is to develop and validate new techniques for pulse data analysis that will be used in neutron and gamma ray measurement systems based on the use of various scintillation detectors. A primary goal of the proposed work is to significantly extend the current pulse shape discrimination capabilities to neutron energies well below 1 MeV and perhaps as low as 100 keV. Specifically, the performance of various detection systems will be assessed by using fast waveform digitizers, and the efficiency of neutron and gamma ray detection and energy resolution will be evaluated using the state-of-the-art research facilities at the University of Michigan (UM) and at LANL’s LANSCE facility. The measurement results will be used to validate Monte Carlo techniques for the simulation of these types of detectors, pioneered by our group at UM.

“Development of a New Graduate Course in Nuclear Safeguards at the Department of Nuclear Engineering and Radiological Sciences at the University of Michigan”

PI: Sara Pozzi

Sponsor: Department of Energy
\$139,000; 7/30/2009 – 12/31/2012

This project provides funding for 17 students from the Department of Nuclear Engineering and Radiological Sciences at the University of Michigan to travel to Oak Ridge National Laboratory for a week-long laboratory experience as a part of the course “Nuclear Safeguards.”

“Digital Fast Neutron Detection System for Simultaneous Time Correlation and Spectrometry”

PI: Sara Pozzi (UM)

Sponsor: Department of Energy, NNSA, NA-22
\$260,000; 11/2010 – 9/2012

Sandia National Laboratories and the University of Michigan are developing an instrument to acquire energy-dependent, time-correlation data. The instrument will use a liquid organic scintillator as the sensing medium and a high-speed, high-resolution digitizer for data acquisition. The instrument will record neutron detection events versus energy and time. The instrument will improve neutron diagnostic capabilities by enhancing characterization of fission chain reaction dynamics.

“Mobile Stand-Off Radiation Detection System and Micro-Miniature Digital Gamma Spectroscopy System”

PI: Sara Pozzi, Co-PI: Marek Flaska, Shaun Clarke

Sponsor: Department of Defense, Defense Threat Reduction Agency
\$830,000; 3 years

Measurements and simulations for a large standoff Compton camera based on scintillation detectors.

“Measurement and Characterization of Nuclear Material at Idaho National Laboratory

PI: Sara Pozzi (UM)

Sponsor: Department of Energy, National Nuclear Security Administration, NA-243
\$75,000; 1 year

“Energy-Angle Correlation in Spontaneous-and-Induced-Fission Neutron Emissions”

PI: Sara Pozzi

Sponsor: Department of Energy, NA-22
\$900,000; 6/2011 – 6/2014

Fast and robust methods for detecting, identifying, and characterizing special nuclear material (SNM) are needed in many applications in the nonproliferation and safeguards areas. Fission is a unique nuclear reaction because it emits multiple neutrons with unique energy, angle, and multiplicity distributions. In the case of nuclear materials, such as uranium and plutonium, fission chains develop

and the neutron multiplicity distributions can be used for the detection, identification, and characterization of the nuclear material. The development of new measurement systems of interest to the NA-22 mission relies on the use of robust Monte Carlo and deterministic codes for their simulation. The quality and reliability of the prediction of measurement scenarios is in turn directly related to the quality of the nuclear data.

“Epithermal and Fast Neutron Detection System for Active and Passive Measurement Applications for National Security and Nuclear Energy”

PI: Sara Pozzi

Sponsor: Department of Energy, Office of Science

\$188,000; 11/2011 – 11/2012

The project will develop a new measurement system, including detectors, electronics, and algorithms, for the measurement of neutrons in the epithermal and fast energy range. The system will be fully scalable and have application to measurements in both passive and active mode that are of interest to national security, nuclear safeguards, and various nuclear energy applications. For instance, the new system can be used to measure fission neutrons from spontaneous and induced fission reactions in various energy ranges. The University of Michigan and Los Alamos National Laboratory have an ongoing collaboration focused on providing much needed neutron energy spectra and multiplicity data for fission in isotopes such as U-235 and Pu-239. The proposed work will significantly expand the existing effort by including neutron detectors that are sensitive to neutrons in the epithermal energy region. The expanded effort will provide the community with a fully scalable measurement system that can be applied to a diverse set of scenarios, ranging from basic nuclear physics experiments to measure fission parameters such as neutron multiplicity and spectra, to nuclear energy applications where parameters from exotic nuclei are studied.

“Liquid Scintillator Multiplicity Counter”

PI: Sara Pozzi

Sponsor: Department of Energy, NNSA

\$200,000; 12/9/2011 – 9/30/2012

This research proposal is aimed at developing a liquid scintillator neutron multiplicity counter (LSNMC), with active interrogation capabilities, for safeguards applications. The one-year project will consist of benchtop experiments using available radiation sources and a simulation study aimed at LSNMC design performed with code MCNPX-PoliMi. Counter parameters such as number, size, and placement of detectors will be optimized. Neutron detection efficiency will be characterized. This work is applicable to both passive analyses and active interrogation and focuses on (a) neutron-based measurements of fissionable nuclear materials, and (b) near real-time measurements for process monitoring. Important aspects of long-term, science-based research and development include small-scale experiments, theory development, and advanced modeling and simulation with validation experiments; this project embraces the science-based R&D approach.

“Basic Physics Data: Improved Fission Neutron Multiplicity”

PI: Sara Pozzi

Sponsor: Department of Energy, NEUP

\$954,000; 9/2011 – 9/2014

“Development of Semi-Autonomous Robots for Hazardous Environments”

PI: David Wehe

Sponsor: Department of Energy

\$4,369,500; 9/1/2004 – 8/31/2013

The University of Michigan extends the capabilities of current mobile robots to provide increased autonomy of remote operations, so that sensors and other technologies can be quickly and safely delivered to interior and outdoor environments of large expanses. The University of Michigan also develops advanced radiation sensing technologies for use in DOE environments. Current projects include the development of hybrid gamma ray imagers, development of unique digital pulse processing techniques, active interrogation for surveillance and monitoring, and micro-mechanical radiation detectors.

Fiscal Year 2013 Research Expenditures

(July 1, 2012 – June 30, 2013)

RESEARCH EXPENDITURES ATTRIBUTED TO AN EXTERNAL SPONSOR

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|------------------|---------------------------------|--|---------------|--------------|
| Collins | Department of Homeland Security | Sub of F026076-VRI-Taxable Consortium for Advanced Simulation of... | F028790 | \$98,496 |
| Downar* | Department of Energy | Scholarships-Sub of F023439 | F023564 | \$20,000 |
| Downar* | Department of Energy | Fellowships | F026647 | \$79,628 |
| Downar | DOE | Fellowships | F023565 | \$10,454 |
| Downar | DOE | Fellowships | F031571 | \$155,266 |
| Downar | DOE - Subcontract | Multi-scale Multi-physics Methods Development for the Calculation... | F023726 | \$233,0254 |
| Downar | DOE – Subcontract | Sub of F026076-MNM-Taxable Consortium for Advanced Simulation of | F028789 | \$7,540 |
| Downar | DOE – Subcontract | Evaluate Nodalization Schemes in TRACE (TRAC RELAP5) | F029486 | \$49041 |
| Downar | DOE – Subcontract | Transient Safety Analysis of Fast Spectrum TRU Burning LWRs | F029679 | \$85,840 |
| Downar | DOE – Subcontract | Sub of F030169-Self-sustaining Thorium Boiling Water Reactors | F030175 | \$50,708 |
| Downar | DOE – Subcontract | Sub of F029451-RTM-PRT CASL | F030364 | \$244,740 |
| Downar | DOE – Subcontract | Sub of F029451-AMA CASL | F030365 | \$75,454 |
| Downar | Nuclear Regulatory Commission | PARCS Development and Assessment for the Next Generation | F023763 | \$161,631 |
| Downar | NRC | PARCS Maintenance and Support for Light Water Reactors (LWRs) | F026439 | \$369,069 |
| Downar | NRC | SubK of F026439-Pennsylvania State University | F026904 | \$11,342 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|---|--|----------------------|---------------------|
| Downar | Nuclear Regulatory Commission – Subcontract | Basic Research on High Temperature Gas Reactor Thermal | F021635 | \$110,720 |
| Foster | Department of Defense, Air Force | Sub of F023760-Michigan Afrl Center of Excellence in Electric Propulsion | F029599 | \$140,891 |
| Foster* | NASA | Non-Intrusive Measurement of Electric Field in Pulsed Nanosecond | F022929 | (\$5,905) |
| Foster* | NASA | Blackout Mitigation Via Cathode Spot Injection of Ceramic Quenchant | F028561 | \$227 |
| Foster | NASA – Subcontract | High Power High Thrust Ion Thruster | F029055 | \$130,750 |
| Foster | NSF | An Investigation of Plasma Formation in Electromechanically Driv | F025922 | \$123,081 |
| Foster | NSF | Plasma-soft Matter Interactions: Towards Understanding the Effect... | F031537 | \$33,111 |
| Foster | NRC | Sub of F024078-Faculty Development Program at UM | F024154 | \$82,686 |
| Gilgenbach | Department of Defense-Air Force | Innovative Inverted Magnetron Experiments and Theory | F024883 | \$275,345 |
| Gilgenbach | DOD-Air Force - Subcontract | Basic Studies of Distributed Discharge Limiters for Counter-HPM | F022658 | \$196,573 |
| Gilgenbach | Department of Defense-Navy – Subcontract | Phase Locking of COTS Magnetrons | F023774 | \$62,829 |
| Gilgenbach | DOE – Subcontract | Ionization Dynamics of Wire Z-Pinches | F019326 | \$0 |
| Gilgenbach* | DOE – Subcontract | Krell Institute Academic Allowance-Department of Nuclear Eng... | F027410 | \$984 |
| Gilgenbach | DOE – Subcontract | Recyclable Transmission Line Experiments on Line at Trans.... | F027694 | \$23,178 |
| Gilgenbach | DOE – Subcontract | Diagnostics of an LTD Recyclable Transmission Line | F032187 | \$31,027 |
| Gilgenbach | L-3 Communications | Support for University Research in Vacuum Electronics | N007747 | \$10,455 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|-------------------------------------|---|----------------------|---------------------|
| Gilgenbach | NRC | Department of Nuclear Engineering and Radiological Sciences-Fac | F029069 | \$212,585 |
| Hammig | DOD-Defense Threat Reduction Agency | Silicon-Based Examination of Gamma-Ray and Newton... | F016785 | (\$207) |
| Hammig | DOD-DTRA | Full Proposal-Active Detection of Fissile Materials via Laser | F031261 | \$318,963 |
| Hammig | DOD-DTRA | Suppression of Interface-induced Noise by the Control of Elect | F028581 | \$235,887 |
| Hammig | DOD-DTRA | Low-cost, Large-Area Fine Radiation Detection via Nano... | M000686 | \$3,186 |
| Hammig | Department of Homeland Security | Silicon-Based 3D Position-Sensitive Scatter Detector | F017068 | (\$6,239) |
| Hammig | DHS – Subcontract | Sub of F028640-PHASE II-Large-area, Wide Band-gap SSPM Detector | F028556 | \$24,580 |
| Hartman* | DOE – Subcontract | Sub of F026751-YR1-Nuclear Forensics Junior Faculty Award Program | F026368 | (\$18) |
| Hartman | DOE – Subcontract | Sub of F026317-Evaluation of Materials for Interim Storage of Spent | F027104 | \$36,736 |
| Hartman | DOE – Subcontract | University of Michigan-Nuclear Forensics Junior Faculty | F030116 | (\$30,446) |
| Hartman | General Electric Company | Sub of N014699-Y1-Experimental Investigation of Gearbox | N014255 | \$16,352 |
| He | DOD-DTRA | Advance Room-Temperature 3-D Semiconductory-Ray Imaging | M000570 | \$831,058 |
| He | DOD-DTRA | Sub of M000570-Fab-Advance Room-Temperature 3-D Semiconductor-Ray | M000583 | \$200,099 |
| He | DOD-DTRA – Subcontract | Target-Linked Radiation Imaging (TLRI) | F024644 | \$0 |
| He | DOD-DTRA – Subcontract | Detection of Shielded Uranium and Plutonium | F029209 | \$7,909 |
| He | DOE | Development of High Resolution 3-Dimensional Position-Sensitive.... | F016320 | \$62,451 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|---|--|----------------------|---------------------|
| He | DOE | Digital 3-Dimensional Position-Sensitive Semiconductor Radiation | F025135 | \$410,150 |
| He | DOE-Subcontract | Quantified understanding of polarization at room temperature... | F032624 | \$94,562 |
| He | DHS | Sub of F023748-YR5-Development of Integrated Real-Time Imaging | F028725 | \$42,307 |
| He | DHS | Sub of F023748-YR5-Development of Integrated Real-Time Imaging | F028918 | \$12,882 |
| He | DHS – Subcontract | Development of a Lower-power Digital ASIC for Compact TIBr.... | F032451 | (\$1,944) |
| Holloway | DOE | Sub of F019844-Center for Radiative Shock Hydrodynamics (CRASH) | F019849 | \$564,725 |
| Jiao | EPRI | Mitigation Strategy for IASCC in Austenitic Stainless Steels | N013529 | \$84,249 |
| Jiao | DOE-Subcontract | Accelerated Irradiations for High Dose Microstructures in Fast... | F031366 | \$73,216 |
| Kammash | DOD-Air Force | ECR Gasdynamic Mirror Thruster | F031102 | \$31,044 |
| Krushelnick | DOD – Advanced Research Projects Agency | Compact Laser Plasma Source of Spatially Coherent | F029130 | \$678,373 |
| Krushelnick | DOD-Advanced Research Projects | Fab of F029130-Multi Axis Micropositioner System | F031062 | \$26,537 |
| Krushelnick | DOD-DTRA | Generation of Miniature Hohlraum X-ray Sources... | F028724 | \$402,531 |
| Krushelnick | DOD-DTRA | Sub of F028724-Generation of Miniature Hohlraum X-ray Sources... | F030345 | \$15,174 |
| Krushelnick | DOD – Navy | High Energy Neutron Beams from Intense Laser Plasma Interactions | F028951 | \$37,810 |
| Krushelnick | DOD – Navy | Sub of F028951-FAB-High Energy Neutron Beams from Intense Laser Plasma | F029358 | \$2,847 |
| Krushelnick | DOD-Navy | Sub of F028951-High Energy Neutron Beams from Intense Laser Plasma | F029048 | \$107,690 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|-------------------|---|----------------------|---------------------|
| Krushelnick | DOD – Navy | Fab of F028951-High Energy Neutron Beams from Intense Laser... | F030884 | \$9,821 |
| Krushelnick | DOE | Intense Laser Interactions with Low Density Plasmas | F027513 | \$180,898 |
| Krushelnick | DHS | Sub of F029654-Y4-Active Interrogation Using Radiation Generated... | F029658 | \$160,713 |
| Krushelnick | DHS | Sub of F029654-Y4-Participant Support Costs-Active Interrogation... | F029894 | \$10,908 |
| Krushelnick | DHS | Fab of F029654-Y4-Active Interrogation Using Radiation... | F030794 | (\$8,001) |
| Krushelnick | DHS | Sub of F029654-Y5-Active Interrogation Using Radiation Generated... | F031691 | \$226,259 |
| Krushelnick | DHS | Sub of F029654-Y5-Active Interrogation Using Radiation Generated | F031829 | \$84,896 |
| Krushelnick | NSF | Femtosecond Probing of Magnetic Fields Generated from Ultra... | R000207 | \$87,095 |
| Krushelnick | NSF | Collaborative Research: Graduate Student Training Through... | R000326 | \$167,387 |
| Larsen | DOE – Subcontract | The Suppression of Energy Discretization Errors in Multigroup | F024273 | \$229,467 |
| Larsen | DOE – Subcontract | Hybrid Monte Carlo/Deterministic Radiation Transport Simulations | F024315 | \$70,966 |
| Larsen | DOE – Subcontract | An Asymptotic “2D-Transport, 1D-Diffusion” Approximation of the | F024414 | \$79,554 |
| Larsen | DOE – Subcontract | Sub of F026076-MNM-Taxable Consortium for Advanced Simulation of | F028788 | (\$29,930) |
| Larsen | DOE – Subcontract | Sub of F029451-RTM-MCH CASL | F030361 | \$189,861 |
| Larsen | DOE – Subcontract | Sub of F029451-RTM-PRT CASL | F030362 | \$54,027 |
| Lau | DOD – Air Force | Advanced RF Sources Based on Novel Nonlinear Transmission | F023644 | \$175,684 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|--|--|----------------------|---------------------|
| Lau | DOE | Theoretical and Experimental Studies of the Magneto-Rayleigh | F023838 | \$60,793 |
| Lau | NSF | Theoretical and Experimental Studies of the Magneto-Rayleigh | F023789 | \$4,291 |
| Lee | DOE – Subcontract | Sub of F026076-MNM-Taxable Consortium for Advanced Simulation of | F028791 | (\$60,827) |
| Lee | DOE – Subcontract | Sub of F029451-RTM-SUP Consortium for Advanced Simulation of Light | F030363 | \$117,281 |
| Lee | DOE – Subcontract | Inherently Safe Light Water Reactors | F033559 | \$14,060 |
| Lee | Korea Atomic Energy Research Institute | Realistic Nuclear Plant Safety Analysis Representing? | N014641 | \$65,567 |
| Manera | EPRI | Thermal Cycling Model Review and Recommendations | N014628 | \$12,647 |
| Manera | DOE – Subcontract | Sub of F029451-Consortium for Advanced Simulation of Light Water | F029619 | \$53,921 |
| Manera | DOE – Subcontract | Sub of F029451-THM-Consortium for Advanced Simulation of Light Water | F030369 | \$120,346 |
| Manera | DOE – Subcontract | Inherently Safe Light Water Reactors | F033492 | \$7,700 |
| Manera | NRC | Multiscale Thermal-Hydraulic Tool for Nuclear Power Plant Safety | F032045 | \$79,539 |
| Martin | DOE – Subcontract | Consortium for Advanced Simulation of Light Water Reactors (CASL) | F026076 | (\$255,119) |
| Martin | DOE – Subcontract | Implementation of On-the-fly Doppler Broadening in MCNP5 | F026319 | \$29,256 |
| Martin | DOE – Subcontract | SubK of F026319-Argonne National Laboratory | F027819 | \$31,592 |
| Martin | DOE – Subcontract | Sub of F026076-MNM-Taxable Consortium for Advanced Simulation of | F028785 | \$24,523 |
| Martin | DOE – Subcontract | Sub of F029451-MPO-Consortium for Advanced Simulation of Light Water | F028786 | \$0 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|---------------------------------------|--|----------------------|---------------------|
| Martin | DOE – Subcontract | Sub of F026076-VRI-Taxable Consortium for Advanced Simulation of Light Water | F028787 | \$0 |
| Martin | DOE – Subcontract | Sub of F026076-University of Wisconsin-Taxable | F028792 | \$69,379 |
| Martin | DOE – Subcontract | Consortium for Advanced Simulation of Light Water Reactors-Non-Tax | F029451 | \$341,312 |
| Martin | DOE – Subcontract | Sub of F029451-CASL | F029620 | \$61,623 |
| Martin | DOE – Subcontract | Sub of F029451-RTM-PRT Consortium for Advanced Simulation of Light | F030366 | \$37,139 |
| Martin | DOE – Subcontract | Sub of F029451-RTM-SUP Consortium for Advanced Simulation of Light | F030367 | \$105,443 |
| Martin* | National Academy for Nuclear Training | Graduate Fellowships in Nuclear Engineering | N008693 | \$13,944 |
| Martin* | NRC | Department of Nuclear Engineering and Radiological Sciences | F020760 | \$227 |
| Martin* | NRC | Proposal to the Nuclear Regulatory Commission to Establish the... | F023382 | \$113,226 |
| Martin | NRC | Faculty Development Program at the University of Michigan | F024078 | (\$287) |
| Pozzi | DOD-DTRA – Subcontract | Sub of F028131-YR2-CLIN0002-Compact Source of Laser-Driven Mono... | F028700 | \$0 |
| Pozzi | DOD-DTRA – Subcontract | Sub of F028595-Phase III-iFind Mobile Detection System | F030148 | \$115,233 |
| Pozzi | DOD-DTRA – Subcontract | Sub of F028131-YR3-CLIN0003-Compat Source of Laser-Driven Monoenerg | F030828 | \$65,193 |
| Pozzi | DOE | Digital Waveform Sampling of Neutron and Gamma Ray Signals | F024818 | \$56,251 |
| Pozzi | DOE | FAB-New University of Michigan Laboratory for Research and Tea... | F026304 | \$0 |
| Pozzi | DOE | Energy-Angle Correlations in Spontaneous and Induced Fission | F028845 | \$376,858 |
| Pozzi | DOE | Epithermal and Fast Neutron Detection System for Active | F030241 | \$151,454 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|-------------------|--|----------------------|---------------------|
| Pozzi* | DOE – Subcontract | Development of a New Graduate Level Course in Nuclear... | F023805 | \$41,044 |
| Pozzi | DOE – Subcontract | Basic Physics Data: Improved Fission Neutron Data... | F023849 | \$57,548 |
| Pozzi | DOE – Subcontract | Sub of F023849-Basic Physics Data: Improved Fission Neutron Data... | F023979 | \$38,875 |
| Pozzi | DOE – Subcontract | Digital Fast Neutron Detection System for Simultaneous Time Cor.... | F027394 | \$96,690 |
| Pozzi | DOE – Subcontract | Basic Physics Data: Measurement of Neutron Multiplicity from Ind | F029588 | \$158,895 |
| Pozzi | DOE – Subcontract | Liquid Scintillator Neutron Multiplicity Counter for Safeguards... | F029784 | \$64,211 |
| Pozzi | DOE – Subcontract | A research initiative under the Next Generation Safeguard | F033460 | \$2,586 |
| Pozzi | DHS | Sub of F026265-YR2-New Detectors, Electronics, and Algorithms for... | F026440 | \$0 |
| Pozzi | DHS | Sub of F026265-YR3-New Detectors, Electronics, and Algorithms for... | F028868 | \$49,071 |
| Pozzi | DHS | Sub of F026265-YR3-New Detectors, Electronics, and Algorithms for... | F029044 | \$15,105 |
| Pozzi | DHS | Sub of F026265-YR3-Brigham Young University | F029047 | \$12,817 |
| Pozzi | DHS | Sub of F026265-Y4 New Detectors, Electronics, and Algorithms for... | F031686 | \$150,269 |
| Pozzi | DHS | Sub of F026265-Y4 BYU | F031686 | \$150,269 |
| Pozzi | DHS | Sub of F026265-Y4 New Detectors, Electronics, and Algorithms for... | F031735 | \$142,075 |
| Thomas | DOD – Air Force | AFOSR Young Investigator Program: Understanding Intense... | F031018 | \$10,263 |
| Thomas | DOE | High Harmonic Radiation Generation and Attosecond Pulses... | F031327 | \$33,212 |

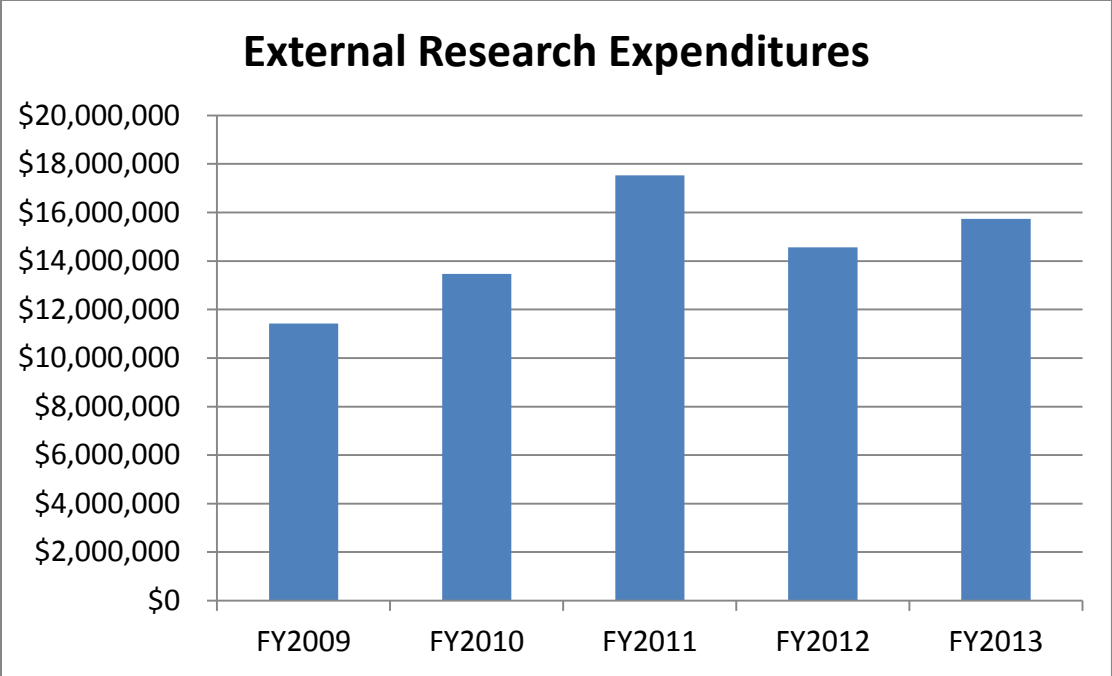
| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|--|--|----------------------|---------------------|
| Thomas | DOE | Sub of F031327-High Harmonic Radiation Generation and Attosecond Pulses... | F031827 | \$35,207 |
| Thomas | NSF | NSF CAREER Proposal: Bright femtosecond x and gamma-ray | F028881 | \$88,808 |
| Thomas | NSF | Non-Linear Optics in Plasmas at Ultra-High Intensities | F023235 | \$32,026 |
| Thomas | NRC | Sub of F024078-Faculty Development Program at UM | F024153 | \$3,335 |
| Wang | DOE | Sub of F022352-Lumin Wang-Particle Induced Amorphization of | F012220 | (\$225) |
| Wang | DOE – Subcontract | Evaluation of Materials for Interim Storage of Spent Fuel for... | F026317 | \$162,654 |
| Wang | DOE – Subcontract | Sub of F026766-Fission Product Transport in Triso Particle Layers | F026933 | \$71,071 |
| Wang* | University of Science and Technology - Beijing | University of Science and Technology Beijing (Training Grant) | N015717 | \$6,062 |
| Wang* | Xiamen University | School of Energy Research, Xiamen University Lab Usage | N015467 | \$24,790 |
| Was | Atomic Energy of Canada Limited | High Dose Proton Irradiation of Ni alloys | N014889 | \$136,813 |
| Was | Electric Power Research Institute | Identifying Mechanisms and Mitigation Strategies for Irradiation | N010827 | \$200,834 |
| Was | EPRI | Factor of Improvement in Resistance of Stress Corrosion Crack... | N012413 | \$81,391 |
| Was | EPRI | Establishing a Cause-and-Effect Relationship Between Localized | N012581 | \$86,650 |
| Was | Electricite De France (EDF) | Irradiation-Accelerated Corrosion of Reactor Core Materials | N013607 | \$93,554 |
| Was | EDF | Irradiation-Accelerated Corrosion of Reactor Core Materials | N013636 | \$19,885 |
| Was | EDF | Sub of N013607-University of Notre Dame | N013889 | \$132,580 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|-------------------|---|----------------------|---------------------|
| Was | DOE | Localized Deformation and Intergranular Fracture of Irradiated... | F021533 | \$104,364 |
| Was | DOE | Sub of F021533-Localized Deformation and Intergranular Fracture of... | F021747 | \$55,430 |
| Was | DOE | Sub of F021533-Localized Deformation and Intergranular Fracture of... | F021748 | \$78,373 |
| Was | DOE | Acquisition of a 3 MV Tandem Accelerator for Research and Teach... | F029265 | \$0 |
| Was | DOE – Subcontract | Identifying Mechanisms and Mitigation Strategies for Irradiation | F022700 | \$255,639 |
| Was | DOE – Subcontract | Corrosion and Creep of Candidate Alloys in High Temperature | F023807 | \$88,561 |
| Was | DOE – Subcontract | Intergranular Attack and Stress Corrosion Cracking in Nickel-Base | F024029 | \$19,312 |
| Was | DOE – Subcontract | Aging and Embrittlement of High Fluence Stainless Steel | F024274 | \$78,572 |
| Was | DOE – Subcontract | Sub of F024274-Aging and Embrittlement of High Fluence Stainless Steel | F024371 | \$69,141 |
| Was | DOE – Subcontract | Microstructure and Property Evolution in Advanced Cladding and... | F026313 | \$107,534 |
| Was | DOE – Subcontract | Irradiation-Accelerated Corrosion of Reactor Core Materials 10-068 | F026314 | \$93,737 |
| Was | DOE – Subcontract | SubK University of Notre Dame | F026379 | \$22,837 |
| Was | DOE – Subcontract | SubK of F026313-University of Wisconsin | F026380 | \$240,513 |
| Was | DOE – Subcontract | Fab of F026314-Irradiation-Accelerated Corrosion of Reactor Core Matter | F026825 | (\$163,636) |
| Was | DOE – Subcontract | Sub of F026766-Fission Product Transport in Triso Particle Layers | F026932 | \$111,737 |
| Was | DOE – Subcontract | Sub of F026961-Development of Barrier Layers for the Protection of... | F028261 | \$59,879 |

| Project Director | Sponsor | Project Title | Project Grant | Expenditures |
|-------------------------|-----------------------|---|----------------------|---------------------|
| Was | DOE – Subcontract | Sub of F029451-Consortium for Advanced Simulation of Light Water Reactors | F029618 | \$133,367 |
| Was | DOE – Subcontract | Mitigating IASCC of Reactor Core Internals by Post-Irradiation | F031891 | \$134,142 |
| Was | DOE – Subcontract | Atomic Ordering in Alloy 690 and its Effect on Long-term Structure... | F032293 | \$103,205 |
| Was | DOE – Subcontract | Accident Tolerant Fuels for Light Water Reactors | F032813 | \$39,434 |
| Was | DOE – Subcontract | Advanced Accident-Tolerant Ceramic Coatings for Zr-alloy Cladding | F033244 | \$10,501 |
| Was | NASA – Subcontract | Production of Microspheres to Support Fuel Fabrication | F030608 | \$204 |
| Was | TerraPower | Heavy Ion Irradiation of HT9 | N013825 | \$235,089 |
| Was* | TerraPower | Acquisition of a 3 MV Tandem Accelerator for Research and Teaching | N014772 | \$213,843 |
| Was* | Various Sponsors | Recharge for MIBL | N009040 | \$124,729 |
| Wehe* | Elsevier Science B.V. | Editorial Services for Journal “Nuclear Instruments... | N007321 | \$11,852 |
| Wehe | DOE | Mobile Robotics and Sensing-Univ Research Prog in Robotics | F010788 | \$124,538 |
| Wehe | DOE | Fab of F010788-Segway Platform | F013275 | \$3,277 |
| Wehe* | DOE – Subcontract | University of Michigan-Nuclear Forensics Junior Faculty | F032354 | \$38,537 |
| Zhang | DOE – Subcontract | Growth of Semiconductors for Room Temperature Gamma-Ray Detection | F029720 | \$56,211 |
| Sub Total: | | | | \$15,741,840 |

*Amounts in parentheses are accounting adjustments

| | |
|---|---------------------|
| Total Research Expenditures Attributed to an External Sponsor | \$15,741,840 |
| Total Internal Research Expenditures | \$1,698,775 |
| GSRA RIP3 Outstate Differential | \$128,990 |
| Grand Total | \$17,569,605 |



Publications

(January 1, 2012 – December 31, 2012)

FISSION SYSTEMS AND RADIATION TRANSPORT

Journal Articles

Gajev, T. Kozlowski, Y. Xu, T. Downar, "Sensitivity and Uncertainty of OECD Benchmark Ringhals-I TRACE/PARCS Stability Prediction," *Nuclear Technology*, Vol. 180, Dec. 2012.

M. Hursin, T. Downar, B. Kochunas, "Analysis of the Core Power Response During a PWR Rod Ejection Transient Using the PARCS Nodal Code and the DeCART MOC Code," *Nuclear Science and Engineering*, Vol. 170, No. 2, Feb. 2012, PP. 151-167.

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N. Brown, V. Seker, S. Revankar, T. Downar, "Transient Simulation of an Endothermic Chemical Process Facility Coupled to a High Temperature Reactor: Model Development and Validation," *Nuclear Engineering and Design*, Vol. 248, July 2012.

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A. Yankov, B. Collins, M. Klein, M.A. Jessee, T. Downar, W. Zwermann, K. Velkov, A. Pautz, "A Two-Step Approach to Uncertainty Quantification of Core Simulators," *Science and Technology of Nuclear Installations*, Vol. 2012, Dec. 2012.

M. Hursin, T. Downar, B. Collins, Y. Xu, "The Development and Implementation of a 1-D SN Method in the 2D-1D Integral Transport Solution," accepted for publication, *Nuclear Science and Engineering*, November, 2012.

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R.C. Wang, Y. Xu, N. Hudson, and T.J. Downar, "Validation of the U.S. NRC Coupled Code System TRITON/TRACE/PARCS with the Special Power Excursion Reactor Test III (SPERT III)," accepted by Nuclear Technology, November, 2012.

S. Prasad, S.D. Clarke, S.A. Pozzi, and E.W. Larsen, "Simulation of Neutron Pulse Height Distributions with a Response Matrix Method," *Nucl. Sci. Eng.*, **172**, 78 (2012)

A.B. Wollaber, E.W. Larsen, and J.D. Densmore, "A Discrete Maximum Principle for the Implicit Monte Carlo Equations," *Nucl. Sci. Eng.*, to appear.

E.R. Wolters, E.W. Larsen, and W.R. Martin, "Hybrid Monte Carlo CMFD Methods for Accelerating Fission Source Convergence," *Nucl. Sci. Eng.*, to appear.

E. Olbrant, E.W. Larsen, M. Frank, and B. Seibold, "Asymptotic Derivation of Time-Dependent Simplified PN Equations," *J. Comp. Phys.*, to appear.

E.W. Larsen, A. Kumar, and J.E. Morel, "Properties of the Implicitly Time-Differenced Equations of Thermal Radiation Transport," *J. Comp. Phys.*, to appear.

F. Abdul Rahman, A. Varuttamaseni, M. Kitner-Meyer, and J.C. Lee, "Application of Fault tree analysis for customer reliability assessment of a distribution power system," *Reliability Engineering and System Safety*, **111**, 76 (2013).

T. Drzewiecki, I. Asher, T. Grunloh, V. Petrov, K. Fidkowski, A. Manera, T. Downar, "Parameter Sensitivity Study of Boiling and Two-Phase Flow Models in CFD," *Journal of Computational Multiphase Flows*, Vol. 4 (4), pp. 411-426 (2012).

T. Kim, V. Petrov, A. Manera, S. Lo, "Analysis of Void Fraction Distribution and Departure from Nucleate Boiling in Single Subchannel and Bundle Geometries using Subchannel, System, and Computational Fluid Dynamics Codes," accepted by *Science and Technology of Nuclear Installations*, 2012.

T. Kim, V.N. Dang, M.A. Zimmerman, A. Manera, "Quantitative evaluation of change in core damage frequency by postulated power uprate: Medium-break loss-of-coolant-accidents," *Annals of Nuclear Energy*, 47, September 2012, 69-80.

J. Freixa, T. Kim, A. Manera, "Thermal-hydraulic analysis of an intermediate LOCA test at the ROSA facility including uncertainty evaluation," *Nuclear Engineering and Design*, 249, 97-103 (2012).

Y. Kozmenkov, U. Rohde, A. Manera, "Validation of the RELAP5 code for the modeling of flashing-induced instabilities under natural-circulation conditions using experiments from the CIRCUS facility," *Nuclear Engineering and Design*, 243, 168-175 (2012).

M. Andreani, D. Bitterman, Ph. Marsault, O. Antoni, Kereszturi, M. Schlagenhauger, A. Manera, M. Seppala, J. Kurki, "Evaluation of a preliminary safety concept for the HPLWR," *Progress of Nuclear Energy*, 55, 68-77 (2012).

K. Banerjee and W.R. Martin, "Kernel Density Estimation Method for Monte Carlo Global Flux Tallies," *Nucl. Sci. Eng.* **170**, 234-250 (March 2012).

W.R. Martin, "Challenges and Prospects for Whole-Core Monte Carlo Analysis," *Nucl. Eng. Tech.* **44**, 239-257 (July 2012).

G. Yesilyurt and W.R. Martin, "On-the-Fly Doppler Broadening for Monte Carlo Codes," *Nucl. Sci. Eng.* **171**, 239-257 (July 2012).

Conference Papers

E.W. Larsen and B.W. Kelley, "CMFD and Coarse-Mesh DSA," *Proc. PHYSOR 2012, Advances in Reactor Physics Linking Research, Industry, and Education*, Knoxville, TN, April 15-20, 2012, on CD-ROM, American Nuclear Society, LaGrange Park, IL (2012).

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T.J. Trahan and E.W. Larsen, "An Asymptotic Homogenized Neutron Diffusion Approximation I. Theory," *Proc. PHYSOR 2012, Advances in Reactor Physics Linking Research, Industry, and Education*, Knoxville, TN, April 15-20, 2012, on CD-ROM, American Nuclear Society, LaGrange Park, IL (2012).

T.J. Trahan and E.W. Larsen, "An Asymptotic Homogenized Neutron Diffusion Approximation II. Numerical Comparisons," *Proc. PHYSOR 2012, Advances in Reactor Physics Linking Research, Industry, and Education*, Knoxville, TN, April 15-20, 2012, on CD-ROM, American Nuclear Society, LaGrange Park, IL (2012).

S. Prasad, S.D. Clarke, S.A. Pozzi, and E.W. Larsen, "Organic Scintillation Detector Response Simulation Using Non-Analog MCNPX-POLIMI," *Proc. PHYSOR 2012, Advances in Reactor Physics Linking Research, Industry, and Education*, Knoxville, TN, April 15-20, 2012, on CD-ROM, American Nuclear Society, LaGrange Park, IL (2012).

K.P. Keady and E.W. Larsen, "A New Biasing Parameter for the Local Importance Function Transform Method," *Proc. M&C 2013, Mathematical & Computational Methods Applied to Nuclear Science & Engineering*

F. Abdul Rahman, F. Franceschini, M. Wenner, and J.C. Lee, "Thorium Fuel Options for Sustained Transuranics Burning in Pressurized Water Reactors," *Proc. WM2012 Conf.*, Phoenix, AZ (2012).

D.A. Fynan, K.-I. Ahn, H.-G. Lim, and J.C. Lee, "Uncertainty Quantification of LBLOCA PCT for a Pressurized Water Reactor by ACE Algorithm and Gaussian Process Model," *Proc. 18th Pacific Basin Nuclear Conference*, Busan, Korea (2012).

A.T. Pavlou, B.R. Betzler, T.P. Burke, J.C. Lee, W.R. Martin, W.N. Pappo, and E.E. Sunny, "Eigenvalue Sensitivity Studies for the Fort St. Vrain High Temperature Gas-Cooled Reactor to Account for Fabrication and Modeling Uncertainties," *Proc. PHYSOR 2012*, Knoxville, TN (2012).

A. Varuttamaseni, J.C. Lee, and R.W. Youngblood, "Uncertainty Quantification for Accident Management Using ACE Surrogates," *Proc. PHYSOR 2012*, Knoxville, TN (2012).

O. Rodrigues Filho and J.C. Lee, "Fracture Toughness Analysis for Different Materials with Leak-Before-Break Applications," *Trans. Am. Nucl. Soc.* **106**, 559 (2012).

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T. Burke, B.R. Betzler, J.C. Lee, W.R. Martin, A. Pavlou, W. Ji, and Y. Li, "A Constrained Sampling Methodology for TRISO Microspheres with Continuous Distributions of Diameters," *Trans. Am. Nucl. Soc.* **107**, 516 (2012).

A.J. Hoffman and J.C. Lee, "A Variable-Order Time-Dependent Neutron Transport Method for Nuclear Reactor Kinetics Using Analytically-Integrated Space-Time Characteristics," submitted for presentation at the M&C Conference, May 2013

A.J. Hoffman and J.C. Lee, "Low-Order Approximations to the Angular Flux Time Derivative for Transport-based Reactor Kinetics," submitted for presentation at the ANS Conference, June 2013.

A. Dave, R. Hu, A. Manera, E. Merzari, D. Pointer, "NSTF Simulations using STAR-CCM+," *Trans. Am. Nucl. Soc.*, Vol. 107, San Diego, California, Nov. 11-15, 2012.

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E.E. Sunny, F.B. Brown, B.C. Kiedrowski, W.R. Martin, "Temperature Effects of Resonance Scattering for Epithermal Neutrons in MCNP," Proc. American Nuclear Society Reactor Physics Topical Meeting, PHYSOR-2012, Knoxville, TN, April 2012.

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Journal Articles

M. Atzmon and J.D. Ju, "A microscopic description of flow defects and relaxation in metallic glasses," submitted to Physical Review Letters, 2012.

K.-D. Li, Q. Wei, L.M. Wang, W. Lu, "Dynamics of nanoscale void/fiber assembly formation in irradiated amorphous materials," International Journal for Multiscale Computational Engineering 10(1), 109-116 (2012).

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W.J. Weber, Y.W. Zhang, L.M. Wang, "Review of dynamic recovery effects on ion irradiation damage in ionic-covalent materials," Nuclear Instruments and Methods in Physics Research B, 277, (2012) 1-5.

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W.X. Li, Y.B. Chen, J.M. Zhang, L.M. Wang, R.C. Ewing, "Controlling the structure and size of Au nanocrystals by annealing and ion sputtering, Langmuir, (2012) 51-55.

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K.J. Kearfott, T. Gotoh, "Crowdsourcing of Radiation Measurements: A Post-Fukushima Daiichi Perspective," proceedings of the American Nuclear Society Radiation Protection and Shielding Division Seventeenth Topical Meeting and International Conference on Radiation Shielding Twelfth Meeting, Nara, Japan, Sept 2-7, 2012, p. 16, abstract book 00249, Poster P1-03.

S. A. Pozzi, S. D. Clarke, W. Walsh, E. C. Miller, J. Dolan, M. Flaska, B. M. Wiegner, A. Enqvist, E. Padovani, J. K. Mattingly, D. Chichester, and P. Peerani, "Validation of MCNPX-PoliMi Fission Models," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

S. D. Clarke, S.A. Pozzi, and E. Padovani, "Photonuclear Physics Modeling in the MCNPX-PoliMi Code," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

J. L. Dolan, E. C. Miller, A. C. Kaplan, L. Huang*, A. Enqvist, M. Flaska, S. D. Clarke, A. Tomanin, P. Peerani, D. L. Chichester, and S. A. Pozzi, "Passive Measurement of Organic-Scintillator Neutron Signatures for Nuclear Safeguards Applications," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

S. F. Naeem, S. D. Clarke, and S. A. Pozzi, "Comparison of Geant4 and MCNPX-PoliMi Induced Fission Models," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

J. K. Polack, A. Poitrasson-Rivière, M. C. Hamel, M. F. Becchetti, K. Ide, S. D. Clarke, M. Flaska, and S. A. Pozzi, "Image Reconstruction Using a Three-Plane, Dual-Particle Imager for Standoff Detection of Special Nuclear Material," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

M. A. Norsworthy, C. A. Miller*, S. D. Clarke, S. A. Pozzi, and T. A. Antaya, "MCNPX Characterization of Compact Superconducting Cyclotron with ^{11}B Target," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

M. F. Becchetti, K. Ide, A. Poitrasson-Rivière, M. C. Hamel, J. K. Polack, S. D. Clarke, M. Flaska, and S. A. Pozzi, "Simulations of the Cosmic-Ray-Induced Neutron Background," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

A. Poitrasson-Rivière, M. Flaska, M. C. Hamel, K. Ide, J. K. Polack, S. D. Clarke, and S. A. Pozzi, "Digital Data Acquisition and Processing for a Neutron-Gamma-Ray Imaging System," IEEE Nuclear Science Symposium Conference Record on CD-ROM, Anaheim, CA USA. 27 Oct. – 3 Nov, 2012.

S. A. Pozzi, S. D. Clarke, W. Walsh, E. Miller, J. Dolan, B. Weiger, M. Flaska, A. Enqvist, S. Naeem, J. Mattingly, and E. Padovani, "MCNPX-PoliMi for the Simulation of the Neutron and Gamma-ray Emissions from Nuclear Fission," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

S. D. Clarke, S. A. Pozzi, M. Flaska, R. B. Oberer, and L. G. Chiang, "Monte Carlo Analysis of Gamma-ray Spectroscopy of Uranium-Oxide Samples," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

S. T. Brown, A. C. Kaplan, J. D. Karbowski, M. A. Norsworthy, S. D. Clarke, S. A. Pozzi (2012), "Simulation of a Novel Active Interrogation System Using MCNPX," Institute of Nuclear Materials Management 53rd Annual Meeting, 15 – 19 July, Orlando, FL, USA.

A. Enqvist, C. C. Lawrence, T. N. Massey and S. A. Pozzi, "Neutron light output functions measured for EJ309 liquid scintillation detectors," Proceedings of INMM 53rd Annual Meeting, Orlando, FL, USA, July 15-19, 2012.

S. F. Naeem, S. D. Clarke, J. L. Dolan, and S. A. Pozzi, "Comparison of Neutron Pulse Height Distributions from Organic Scintillators Calculated by Geant4 and MCNPX-PoliMi," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

E. C. Miller, S. D. Clarke, S. A. Pozzi, P. Marleau, and J. K. Mattingly, "Characterization of Special Nuclear Material using a Time-Correlated Pulse-Height Analysis," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

S. Prasad, S. D. Clarke, S. A. Pozzi, and E. W. Larsen, "Time-Dependent Nonanalog MCNPX-PoliMi Scintillation Detector Response for Neutrons," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

M. M. Bourne, S. D. Clarke, E. C. Miller, C. M. Mussi, S. A. Pozzi, and A. Gueorguiev (2012), "Characterization of the CLYC Detector for Neutron and Photon Detection," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

M. C. Hamel, A. Poitrasson-Rivière, J. K. Polack, K. Ide, M. Becchetti, S. D. Clarke, M. Flaska, and S. A. Pozzi, "Terrestrial and Cosmic Background Radiation Effects on a Dual-Particle Imaging System," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

C. C. Lawrence, A. Enqvist, T. Massey, M. Flaska, S. D. Clarke, S. A. Pozzi, and F. D. Becchetti, "Response Characterization for the Hydrogen-based Liquid Scintillation Detector EJ309," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

M. Paff, S. D. Clarke, E. Miller, S. A. Pozzi, S. Kiff and E. Padovani. "MCNPX Simulations of UF6 Neutron Spectroscopy Measurements using Liquid Scintillator Detectors for 235U Enrichment Determination," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

J. L. Dolan, M. J. Marcath*, M. Flaska, S. A. Pozzi, D. L. Chichester, A. Tomanin, P. Peerani, D. Cester, and G. Nebbia, "Active-Interrogation Measurements of Induced-Fission Neutrons from Low-Enriched Uranium," Institute of Nuclear materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

A. C. Kaplan, J. L. Dolan, M. Flaska, S. A. Pozzi, and D. L. Chichester, "Validation of the MCNPX-PoliMi Code to Design a Fast Neutron Multiplicity Counter," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, FL, USA. 15 – 19 July, 2012.

B. Wieger, A. Enqvist, S. A. Pozzi, "Multiplicity Distributions and Energy-Angle Correlations in Spontaneous Fission Neutron Emissions," Institute of Nuclear Materials Management 53rd Annual Meeting, Orlando, Florida. July 15-19, 2012.

J. Mattingly, E. Miller, C.J. Solomon, B. Dennis, A. Meldrum, S. Clarke, S. Pozzi, "An Evaluation of Monte Carlo Simulations of Neutron Multiplicity Measurements of Plutonium Metal," Transactions of the American Nuclear Society, 2012.

Patents

U.S. 8,274,062 B2, "Integrative and real-time radiation measurement methods and systems," K.J. Kearfott. U.M. Disclosure #2440.3. Issued September 25, 2012. 20 claims.

Service

(January 1, 2012 – December 31, 2012)

SERVICE TO THE DEPARTMENT, COLLEGE, AND UNIVERSITY

| | |
|--|----------|
| Member, NERS Curriculum Committee | Atzmon |
| Member, MSE Graduate Committee | Atzmon |
| Member, NERS Graduate Committee | Atzmon |
| Advisor, Engineering Physics | Atzmon |
| Coordinator, Materials Option for NERS | Atzmon |
| Director, NERS Undergraduate Program | Bielajew |
| Coordinator, ABET for NERS | Bielajew |
| Chair, Undergraduate Program Committee | Bielajew |
| Member, SACUA Library Committee | Bielajew |
| Member, Engineering Faculty Library Advisory Committee | Bielajew |
| Member, ENG 101 Steering Committee | Bielajew |
| Advisor, NERS Undergraduate Students | Bielajew |
| Chair, NERS Graduate Committee | Downar |
| Chair, NERS Safety Committee | Foster |
| Chair, NERS Master's Program | Foster |
| Member, NERS Executive Committee | Foster |
| Member, Applied Physics Executive Committee | Foster |
| Member, Center for Research on Learning and Teaching Advisory Board | Foster |
| Member, Rackham-NSF Bridges Advisory Board | Foster |
| Member, Rackham AGEP | Foster |
| Member, Center for Engineering Diversity and Outreach Faculty Advisory Council | Foster |
| Member, Imes-Moore Bridge Committee | Foster |
| Member, NERS Graduate Committee | Foster |
| Advisor, Faculty-NSBE | Foster |
| Member, COE Task Force on Master's Program | Foster |
| Reviewer, Rackham Merit Fellowship | Foster |
| Reviewer, CLRT GSI Award | Foster |
| Reviewer, CLRT Grants | Foster |
| Host, DACEP with "Wolverine Plasma Academy" Lecture and Tour | Foster |
| Member, Casebook Review Committee, Marek Flaska (NERS) | Foster |
| Member, Casebook Review Committee, Chris Parkenson (AOSS) | Foster |
| Member, CEDO Search Committee | Foster |
| Member, NERS Faculty Search Committee | Foster |
| Member, MIPSE Executive Committee | Foster |
| Representative, COE-Aerospace Engineering Faculty Search | Foster |
| Panelist, M-STEM, August 3, 2012 | Foster |
| Speaker, SMESG Grant Writing Workshop | Foster |
| Member, NERS Executive Committee | He |
| Chair, UM Senate Advisory Committee on University Affairs (SACUA) | Kearfott |

SERVICE TO THE DEPARTMENT, COLLEGE, AND UNIVERSITY

| | |
|--|-------------|
| Chair, UM Senate Assembly | Kearfott |
| Chair, UM Senate Assembly Committee on University Values | Kearfott |
| Chair, UM Senate Assembly Ann Arbor Provost's Committee on Budgetary Affairs | Kearfott |
| Member, NERS Curriculum Committee | Kearfott |
| Member, NERS Committee for Preparation of Doctoral Exams in Measurements | Kearfott |
| Member, UM Radiation Policy Committee | Kearfott |
| Member, UM Ford Nuclear Reactor Decommissioning Review Committee | Kearfott |
| Member, UM Goldwater Scholarship Committee | Kearfott |
| Member, UM Advisory Board on Intercollegiate Athletics | Kearfott |
| Member, SACUA Liaison, UM Civil Liberties Board | Kearfott |
| Member, SACUA Liaison, Academic Affairs Advisory Committee | Kearfott |
| Member, UM Faculty Hearing Committee | Kearfott |
| Member, UM Faculty Grievance Monitor | Kearfott |
| Advisor, Faculty-oSTEM | Kearfott |
| Advisor, Faculty-UM NERS Health Physics Society Student Branch | Kearfott |
| Director, Center for Ultrafast Optical Science | Krushelnick |
| Member, Center for Ultrafast Optical Science (CUOS) Executive Committee | Krushelnick |
| Member, Scholastic Standing Committee | Krushelnick |
| Member, NERS Graduate Committee | Krushelnick |
| Director, High Field Science at CUOS | Krushelnick |
| Chair, NERS Colloquium Committee | Larsen |
| Chair, NERS Curriculum Committee | Larsen |
| Member, COE Curriculum Committee | Larsen |
| Advisor, NERS Undergraduate Students | Larsen |
| Chair, NERS Plasma Option | Lau |
| Member, NERS Curriculum Committee | Lau |
| Member, NERS Colloquium Committee | Lau |
| Member, COE Awards Committee | Lau |
| Chair, NERS Faculty Search Committee | Lee |
| Member, NERS Executive Committee | Lee |
| Member, COE Research Advisory Committee | Lee |
| Member, NERS NRC Fellowship Committee | Lee |
| Member, COE Honors and Awards Committee | Lee |
| Panelist, "Teaching Engineering," COE | Manera |
| Member, NERS Graduate Committee | Martin |
| Member, Tenure Casebook Committee, Thomas Wenisch (EECS) | Martin |
| Member, COE Nomination Committee | Martin |
| Member, Lecturer Major Review Committee, Mimi Adam (TechComm) | Martin |
| Representative, COE-Faculty Candidates in ECE and CSE | Martin |
| Chair, Promotion Committee for a PRS in NERS | Pozzi |
| Member, COE Entrepreneurship Task Force | Pozzi |
| Member, Dean's Advisory Committee on Diversity | Pozzi |
| Member, COE Faculty Committee on Discipline | Pozzi |

SERVICE TO THE DEPARTMENT, COLLEGE, AND UNIVERSITY

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|--|--------|
| Member, COE International Programs Committee | Pozzi |
| Member, Rackham Faculty Allies for Diversity in Graduate Education | Pozzi |
| Member, NERS Graduate Committee | Pozzi |
| Member, NERS Faculty Search Committee | Pozzi |
| Member, Michigan Memorial Phoenix Project Advisory Board | Pozzi |
| Mentor, Japan-US Advanced Collaborative Education Program, Nagoya University | Pozzi |
| Member, NERS Executive Committee | Thomas |
| Member, NERS Undergraduate Committee | Thomas |
| Member, Center for Ultrafast Optical Science Executive Committee | Thomas |
| Member, MIPSE Executive Committee | Thomas |
| Advisor, NERS Undergraduates | Thomas |
| Advisor, COE Engineering Advising Center | Thomas |
| Lecturer, ENG 110 Class (lecture on NERS) | Thomas |
| Member, COE Scholastic Standing Committee | Wang |
| Member, EMAL Executive Committee | Wang |
| Member, COE International Program Committee | Wang |
| Ambassador, COE International | Wang |
| Member, COE Executive Committee | Was |
| Chair, NERS Measurements Option | Wehe |
| Member, NERS Curriculum Committee | Wehe |
| Member, Ivor K. Mclvor Award Committee | Wehe |
| Member, Promotion Committee for Marek Flaska | Wehe |

SERVICE TO THE NATION

| | |
|---|-------------|
| Member, DOE Fusion Energy Services Advisory Committee (FESAC) (Nominated) | Foster |
| Member, National Academies Plasma Committee | Foster |
| Reviewer, Proposals-DOE for STTRs | Foster |
| Member, DOE NA-22 Office Review Panel at PNNL, March 2, 2012 | He |
| Member, DOE NA-22 Office Review Panel at LANL, March 29, 2012 | He |
| Member, DOE Energy Environmental Management Advisory Board (EMAB) | Kearfott |
| Reviewer, DOE Office of Nuclear Energy University Programs (NEUP) Grant Program | Kearfott |
| Member, Brookhaven National Laboratory External Advisory Panel, Accelerator Science | Krushelnick |
| Member, Omega Laser Facility, DOE Lab for Laser Energetics Scheduling Committee | Krushelnick |
| Reviewer, Proposals-National Science Foundation | Krushelnick |
| Reviewer, Proposals-Department of Energy | Krushelnick |
| Reviewer, Proposals-CNRS, France | Krushelnick |
| Reviewer, Proposals-NSERC, Canada | Krushelnick |
| Reviewer, Proposals, Panel Member-UC system, administered labs | Krushelnick |
| Member, Science of NIF Workshop Panel (LLNL) | Krushelnick |
| Consultant, Los Alamos National Laboratory | Larsen |
| Reviewer, Proposals-Department of Energy | Lau |
| Reviewer, Proposals-AFOSR | Lau |

SERVICE TO THE NATION

| | |
|--|--------|
| Reviewer, Proposals-US-Israel Binational Science Foundation | Lau |
| Consultant, Naval Research Laboratory | Lau |
| Member, DOE Office of Nuclear Energy Advanced Reactor Concepts Technical Review Panel | Lee |
| Reviewer, Proposals-NEUP | Lee |
| Expert Reviewer, Italian Evaluation of Research Quality, Ministry of Education, Italy | Manera |
| Member, Technical Review Panel for INCITE | Manera |
| Chair, Department of Energy INCITE Nuclear Physics Review Panel | Martin |
| Member, Phase II Study Committee, Review of the Quality of Science and Engineering Research at the National Security Labs, National Research Council | Martin |
| Member, Review Panel, DOE Office of Nonproliferation and Verification R&D, PNNL | Martin |
| Member, Nuclear Science & Technology Peer Review Committee, INL | Martin |
| Member, Review Committee, EESA Directorate at ANL, University of Chicago | Martin |
| Reviewer, NEUP Proposals | Pozzi |
| Reviewer, Department of Energy, NNSA NA-22 Projects | Pozzi |
| Reviewer, NSF Proposals | Thomas |
| Reviewer, Proposals-DOE Nuclear Engineering University Program | Wang |
| Reviewer, Proposals-DOE Basic Energy Sciences | Wang |
| Reviewer, NSF Proposals | Wang |
| Reviewer, NSF Proposals | Was |
| Reviewer, DOE Career Award Proposals | Was |
| Reviewer, ATR User Program Proposals | Was |
| Reviewer, NEUP Proposals | Was |
| Reviewer, Proposals-DOE NA-22, DNDO, and DTRA Radiation Detection Projects | Wehe |
| Member, DOE Interagency Forensics Panel for Nonproliferation and Arms Control | Wehe |
| Member, PNNL Advisory Panel for the Ultra-Sensitive Nuclear Measurements Initiative | Wehe |

SERVICE TO THE PROFESSION

| | |
|---|----------|
| Chair, Session at the Fall Meeting of the Materials Research Society, Boston | Atzmon |
| Member, Steering Committee, International Symposium on Metastable, Mechanically Alloyed and Nanocrystalline Materials | Atzmon |
| Member, Chemistry and Physics of Materials Committee, TMS | Atzmon |
| Member, Awards Committee, Materials Research Society | Atzmon |
| Chair, Ion Thruster Session for AIAA Joint Propulsion Conference | Foster |
| Chair, Plasma Thrusters Session for APS Gaseous Electronics Conference | Foster |
| Member, IEEE PSAC | Foster |
| Member, Program Committee of SPIE International Symposium on Optical Science, Engineering, and Instrumentation | He |
| Member, Great Lakes Health Physics Society Chapter Executive Council | Kearfott |
| Member, Health Physics Society Decommissioning Section Executive Board | Kearfott |
| Member, American Nuclear Society Planning Committee | Kearfott |

SERVICE TO THE PROFESSION

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|---|-------------|
| Member, Planning Committee, International Radiation Protection Association Planning Committee for IRPA 13 International Congress | Kearfott |
| Secretary/Treasurer, American Physical Society, Division of Plasma Physics | Krushelnick |
| Member, Laser Acceleration Workshop (Goa, India, 2013) Program Committee | Krushelnick |
| Member, SPIE Conference on High Power Lasers (Prague, 2013) Program Committee | Krushelnick |
| Member, APS Division of Plasma Physics Conference (Providence, 2012) Committee | Krushelnick |
| Member, Technical Review Committee-Mathematics & Computation Division of ANS | Larsen |
| Member, Program Subcommittee, APS Plasma Physics Division Annual Meeting | Lau |
| Vice-Chair, Nuclear Installation Safety Division, ANS | Lee |
| Member, International Advisory Committee, Department of Nuclear and Quantum Engineering, Korea Advanced Institute of Science and Technology | Lee |
| Visiting Professor, Pohang University of Science and Technology | Lee |
| Session Organizer, NURETH-15 | Manera |
| Member, Technical Program Committee for International Conference on Advances in Reactor Physics, PHYSOR-2012 | Manera |
| General Chair, ANS M&C Topical Meeting | Martin |
| Member, ANS Honors and Awards Committee | Martin |
| Member, ANS M&C Topical Meeting, Program Committee | Martin |
| Member, MIT Department of Nuclear Science and Engineering Visiting Committee | Martin |
| Member, University of Tennessee Department of Nuclear Engineering Board of Visitors | Martin |
| Member, Review Committee, EESA Directorate at ANL, University of Chicago | Martin |
| Member, Idaho National Lab, Nuclear Science and Technology Peer Review Committee | Martin |
| Chair, Rennselaer Polytechnic University External Advisory Board | Martin |
| Chair, Los Alamos National Laboratory, Computational Physics and Applied Mathematics Capability Review Committee | Martin |
| Member, Nuclear Science & Technology Peer Review Committee, INL | Martin |
| Member, Nuclear Engineering and Technology Capability Review Committee, LANL | Martin |
| Member, External Review Committee for Computation, LLNL | Martin |
| Member, External Advisory Council, Department of Nuclear Engineering, NC State | Martin |
| Member, Institute of Nuclear Materials Management (INMM)-Elected | Pozzi |
| Advisor, UM Institute of Nuclear Materials Management Student Chapter | Pozzi |
| Chair, Honors & Awards Committee, Radiation Instrumentation Steering Committee of the IEEE Nuclear and Plasma Sciences Society | Pozzi |
| Chair/Organizer, Second MCNP-PoliMi Workshop, Ann Arbor, 2012 | Pozzi |
| Member, Technical Program Committee IEEE Nuclear Science Symposium and Medical Imaging Conference, 2012 | Pozzi |
| Member, Expert Advisory Group, European Union FP7 project SCINTILLA | Pozzi |
| Member, European Safeguards Association, Nondestructive Assay Working Group | Pozzi |
| Member, European Safeguards Association, Novel Approaches/Novel Technologies Working Group | Pozzi |
| Chair, High Energy Density Science Association | Thomas |
| Session Chair, "Laser plasma acceleration of electrons," APS, Division of Plasma Physics Annual Meeting (2012) | Thomas |
| Member, Technical Organizing Committee-2013 Pulsed Power Plasma Sciences Conf. | Thomas |

SERVICE TO THE PROFESSION

| | |
|---|------|
| Member, ANS International Program Committee | Wang |
| Member, IAEA Group on Very Long Term Storage of Used Nuclear Fuels | Wang |
| Adjunct Chair Professor, Xiamen University, School of Energy Research | Wang |
| Chair, International Cooperative Group on Environmentally Assisted Cracking | Was |
| Member, TMS Nuclear Materials Committee | Was |
| Member, TMS Corrosion and Env. Effects Committee | Was |
| Member, MRS, Special Programs Committee | Was |
| Member, AFCI/GenIV Materials Working Group, LLNL | Was |
| Member, International Conference on Environmental Degradation of Materials in Light Water Reactors Organizing Committee | Was |
| Chair, Materials Review Capability Team, LLNL | Was |
| Member, Expert Panel on Primary & Secondary NPP Structural Metals Systems | Was |
| Member, EPRI Roadmap for Development of Radiation Resistant Materials | Was |
| Member, International Conference on Fusion Reactor Materials | Was |
| Conference Chair, Symposium on Radiation Measurements and Applications | Wehe |

EDITORIAL SERVICES

| | |
|--|-------------|
| Associate Editor, Physics of Plasmas | Gilgenbach |
| International Advisory Board, Plasma Physics and Controlled Fusion | Krushelnick |
| Editorial Board, International Journal for Science and Technology of Nuclear Installations | Manera |
| Lead Editor, "Selected papers from the OECD-NEA PSBT Benchmark" issue in IJSTNI | Manera |
| Editorial Board, Journal of Nuclear Energy Science & Power Generation Technology | Manera |
| Associate Editor, Journal of Computational Physics | Martin |
| Advisory Editor, Nuclear Science and Engineering | Martin |
| Editorial Board, Transport Theory and Statistical Physics | Martin |
| Guest Editor, Nuclear Instruments and Methods A | Pozzi |
| Editorial Board, Journal of Nuclear Materials | Was |
| Editorial Board, Metallurgical Transactions A | Was |
| Editor, Nuclear Instruments in Physics Research | Wehe |
| Editor, Nuclear Energy and Technology | Wehe |

JOURNAL REVIEW

| | |
|---|--------|
| Reviewer, Acta Materialia | Atzmon |
| Reveiwler, Chemical Physics Letters | Atzmon |
| Reviewer, Intermetallics | Atzmon |
| Reviewer, Journal of Alloys and Compounds | Atzmon |
| Reviewer, Journal of Applied Physics | Atzmon |
| Reviewer, Journal of Materials Research | Atzmon |
| Reviewer, Journal of Materials Science | Atzmon |
| Reviewer, Materials Research Bulletin | Atzmon |

JOURNAL REVIEW

| | |
|--|-------------|
| Reviewer, Materials Science and Engineering A | Atzmon |
| Reviewer, Physical Review B | Atzmon |
| Reviewer, Physical Review Letters | Atzmon |
| Reviewer, Script Materialia | Atzmon |
| Reviewer, NSE/NucTech/ANE/AIP | Downar |
| Reviewer, Journal of Propulsion and Power | Foster |
| Reviewer, IEEE Transactions on Plasma Science | Foster |
| Reviewer, The Physics of Plasmas | Foster |
| Reviewer, Plasma Sources Science and Technology | Foster |
| Reviewer, Journal of Physics D | Foster |
| Reviewer, Plasma Physics and Controlled Fusion | Foster |
| Reviewer, Plasma Chemistry and Plasma Processing | Foster |
| Reviewer, Review of Scientific Instruments | Foster |
| Reviewer, IEEE Electron Devices Letters | Foster |
| Reviewer, Journal of Aerospace Engineering | Foster |
| Reviewer, Surface and Coatings Technology | Foster |
| Reviewer, Nuclear Instruments and Methods in Physics Research, B | Foster |
| Reviewer, Physics of Plasmas | Gilgenbach |
| Reviewer, IEEE Transactions on Plasma Science | Gilgenbach |
| Reviewer, Nuclear Instruments and Methods in Physics Research A | He |
| Reviewer, IEEE Transactions on Nuclear Sciences | He |
| Reviewer, Journal of Nuclear Medicine | Kearfott |
| Reviewer, Health Physics | Kearfott |
| Reviewer, Medical Physics | Kearfott |
| Reviewer, Nuclear Instrumentation and Methods Phys Rev A | Kearfott |
| Reviewer, Radiation Measurement | Kearfott |
| Reviewer, Physical Review Letters | Krushelnick |
| Reviewer, Physical Review E | Krushelnick |
| Reviewer, Physics of Plasmas | Krushelnick |
| Reviewer, Plasma Physics and Controlled Fusion | Krushelnick |
| Reviewer, New Journal of Physics | Krushelnick |
| Reviewer, Applied Physics Letters | Krushelnick |
| Reviewer, Review of Modern Physics | Krushelnick |
| Reviewer, Annals of Nuclear Energy | Larsen |
| Reviewer, Journal of Computational Physics | Larsen |
| Reviewer, Nuclear Science and Engineering | Larsen |
| Reviewer, Transport Theory and Statistical Physics | Larsen |
| Reviewer, Appl. Phys. Lett. | Lau |
| Reviewer, J. Appl. Phys. | Lau |
| Reviewer, IEEE Trans. Plasma Sci. | Lau |
| Reviewer, IEEE Trans. Electron Devices | Lau |
| Reviewer, Phys. Plasmas | Lau |
| Reviewer, Nuclear Science and Engineering | Lee |

JOURNAL REVIEW

| | |
|---|--------|
| Reviewer, Nuclear Technology | Lee |
| Reviewer, Nuclear Engineering and Design | Lee |
| Reviewer, IEEE Transactions on Nuclear Science | Lee |
| Reviewer, Annals of Nuclear Energy | Lee |
| Reviewer, Nuclear Engineering and Design | Manera |
| Reviewer, Chemical Engineering Science | Manera |
| Reviewer, International Journal for Science and Technology of Nuclear Installations | Manera |
| Reviewer, Nuclear Technology | Manera |
| Reviewer, NURETH-15 | Manera |
| Reviewer, CFD4NRS-4 | Manera |
| Reviewer, Annals of Nuclear Energy | Martin |
| Reviewer, Nuclear Engineering and Design | Martin |
| Reviewer, Nuclear Science and Engineering | Martin |
| Reviewer, Transport Theory and Statistical Physics | Martin |
| Reviewer, IEEE Transactions on Nuclear Science | Pozzi |
| Reviewer, Nuclear Science and Engineering | Pozzi |
| Reviewer, Transport Theory and Statistical Analysis | Pozzi |
| Reviewer, Nuclear Instruments and Methods in Physics Research A and B | Pozzi |
| Reviewer, Radiation Measurements | Pozzi |
| Reviewer, Phys Rev Lett | Thomas |
| Reviewer, Plasma Physics and Controlled Fusion | Thomas |
| Reviewer, New Journal of Physics | Thomas |
| Reviewer, Physical Review Special Topics – Accelerators and Beams | Thomas |
| Reviewer, Physics of Plasmas | Thomas |
| Reviewer, APL, JAP, NIMB, JNM | Wang |
| Reviewer, Metallurgical Transactions A | Was |
| Reviewer, Journal of Nuclear Materials | Was |
| Reviewer, Corrosion | Was |
| Reviewer, Corrosion Science | Was |
| Reviewer, Nuclear Technology | Was |
| Reviewer, Acta Materialia | Was |
| Reviewer, Journal of Plasticity | Was |
| Reviewer, IEEE Trans. Nucl. Sci. | Wehe |
| Reviewer, IEEE Trans. Med. Imaging | Wehe |

Personnel

(September 1, 2012 – August 31, 2013)

FACULTY

Yugo Ashida

Assistant Research Scientist

PhD, Machine Intelligence and Systems Engineering, Tohoku University, 1999

Irradiation assisted stress corrosion cracking in neutron-irradiated stainless steels in light water reactor systems

Michael Atzmon

Professor

Also Professor, Materials Science and Engineering

PhD, Applied Physics, California Institute of Technology, 1985

Thermodynamics of materials, diffusion of solids, amorphous metal alloys, ion beam modification of materials

Alex F. Bielajew

Professor

PhD, Theoretical Physics, Stanford University, 1982

Theory of electron and photon transport, Monte Carlo theory and development, radiation dosimetry theory, radiotherapy treatment planning algorithms

David Chalenski

Assistant Research Scientist

PhD, Electrical and Computer Engineering, Cornell University, 2010

Wide array and gas puff z-pinch physics, applications of pulsed power, q-switched laser design, optical diagnostics, high-speed digital circuits

Shaun Clarke

Assistant Research Scientist

PhD, Nuclear Engineering, Purdue University, 2007

Simulation techniques for active-interrogation systems using high-energy photons. Methods under investigation include photoneutron energy spectra and multiplicity analysis

Benjamin Collins

Assistant Research Scientist

PhD, Nuclear Engineering and Radiological Sciences, 2011

Multiscale Methods for Nuclear Reactor Analysis

Thomas Downar

Professor

PhD, Nuclear Engineering, Massachusetts Institute of Technology, 1984

Computational nuclear reactor physics, nuclear reactor dynamics, and the development of coupled neutronics and thermal-hydraulics methods for power reactor safety analysis.

James J. Duderstadt

Professor

President Emeritus, University of Michigan

University Professor of Science and Engineering

PhD, Engineering Science and Physics, California Institute of Technology, 1967

Nuclear systems, computer simulation, science policy, higher education

Rodney C. Ewing

Professor

Also Professor, Materials Science and Engineering

And Professor, Geological Sciences

PhD, Mineralogy/Geology, Stanford University 1974

Nuclear waste management, radiation effects in complex ceramics and glasses.

Marek Flaska

Assistant Research Scientist

PhD, Nuclear Engineering, Delft University of Technology, Delft, the Netherlands, 2006

The development of new methods for accurate identification and characterization of special nuclear material and radioactive sources for applications in nuclear nonproliferation, nuclear safeguards, and homeland security; Monte Carlo simulations and experiments and analyses with organic scintillators and capture-gated detectors

John E. Foster

Associate Professor

PhD, Applied Physics, University of Michigan, 1996

Low-temperature plasma physics including applications in the areas of space propulsion plasmas, environmental plasmas, space and atmospheric plasma phenomena, energy conversion plasmas, and processing plasmas

Ronald M. Gilgenbach

Chair and Chihiro Kikuchi Collegiate Professor

Director, Plasma, Pulsed Power, and Microwave Laboratory

PhD, Electrical Engineering, Columbia University, 1978

Plasmas, fusion, electron beams, high power microwave generation, z-pinches, interaction of intense laser and particle beams with plasmas and materials.

Mark Hammig

Assistant Research Scientist

PhD, Radiation Measurements, University of Michigan, 2004

Development of miniature sensors that use mechanical rather than electrical signals to detect ionizing radiation

Zhong He

Professor

PhD, Physics, University of Southampton, United Kingdom, 1993

Room-temperature semiconductor, gamma-ray detectors, and gamma-ray imaging devices

James P. Holloway

Professor

Associate Dean for Undergraduate Education

PhD, Engineering Physics, University of Virginia, 1989

Neutron and photon transport theory, nuclear reactor physics and control, nonlinear dynamics, inverse problems, plasma kinetic theory, mathematical analysis of engineering problems, computational physics and engineering, primary energy production.

Zhijie Jiao

Associate Research Scientist

PhD (Materials Science) Polytechnic University, New York, 2004

Irradiation effects and environmental degradation of cladding and structural materials for reactor systems

Kimberlee J. Kearfott

Professor

Also Professor, Biomedical Engineering

Adjunct Professor, Radiology

ScD (Nuclear Engineering), Massachusetts Institute of Technology, 1980

Radiation safety regulation, detection, dosimetry, and dose assessment; environmental radioactivity, explosives detection, medical and radiological imaging

Karl M. Krushelnick**Professor**

Associate Director of the Center for Ultrafast Optical Sciences

PhD (Plasma Physics), Princeton University, 1994

Plasma physics, ultra-high intensity laser plasma interactions, inertial confinement fusion, compact laser-based particle accelerators and applications

Mark Kushner**Professor**

Also Professor, Electrical Engineering and Computer Science

PhD (Applied Physics), California Institute of Technology, 1979

Applied electromagnetics, optics and phototonics, quantum science and engineering, plasma science and engineering, energy and power

Edward W. Larsen**Professor**

PhD (Mathematics), Rensselaer Polytechnic Institute, 1971

Analytic and numerical methods for nuclear reactor theory, neutron transport, non-linear radiative transfer, electron and photon transport.

Y.Y. Lau**Professor**

PhD (Electrical Engineering), Massachusetts Institute of Technology, 1973

Theory of plasmas: high power microwaves, noise, intermodulation, ultra-intense laser plasma interaction, wire Z-pinch physics, heating phenomenology, nano-diodes

John C. Lee**Professor**

PhD (Nuclear Engineering), University of California-Berkeley, 1969

Nuclear reactor theory, reactor core physics and design analysis, reactor kinetics, fuel cycle analysis, reactor safety analysis, power plant simulation and control

Annalisa Manera**Associate Professor**

PhD (Nuclear Engineering), Delft University of Technology, the Netherlands, 2003

Experimental single and two-phase flow, computational fluid dynamics, and multiphysics methods for power reactor safety analysis

William R. Martin

Professor

PhD (Nuclear Engineering), University of Michigan, 1976

Computational methods for the solution of problems in neutron transport, reactor core analysis, reactor thermal hydraulics, and nonlinear radiation transport, including algorithms for advanced computer architectures

Sara A. Pozzi

Associate Professor

PhD (Nuclear Engineering) Polytechnic of Milan, Italy, 2001

Nuclear materials measurements for nuclear nonproliferation, nuclear material control accountability, and national security; Monte Carlo code development for neutron and photon transport

Alexander Thomas

Assistant Professor

PhD (Physics), Imperial College of London, UK, 2006

Plasma physics, ultra-high intensity laser-plasma interactions, compact laser-based particle accelerators, particle-in-cell simulation, radiation generation and back-reaction, laser propagation in plasma at high intensity, inertial confinement fusion, Vlasov-Fokker-Planck modeling, non-local transport, magnetized plasmas, electromagnetic and electrothermal instabilities

Lumin Wang

Professor

PhD (Materials Science), University of Wisconsin-Madison, 1988

Ion beam modification of materials, transmission electron microscopy, nanocrystalline materials, and nuclear materials

Gary S. Was

Professor

Also Professor, Materials Science and Engineering

Walter J. Weber, Jr. Professor of Sustainable Energy, Environmental, and Earth Systems Engineering

Director, Michigan Ion Beam Laboratory

ScD (Nuclear Materials Engineering), Massachusetts Institute of Technology, 1980

Radiation materials science, materials degradation and design for advanced reactor systems, materials processing with radiation, ion beam modification and analysis of materials, corrosion, stress corrosion cracking, hydrogen embrittlement, materials degradation modes, nuclear fuels and fuel materials

David K. Wehe

Professor

PhD (Nuclear Engineering), University of Michigan, 1984

Gamma ray imaging, neutron physics, radiation spectroscopy, artificial intelligence and robotics applications, power plant reliability

Louise Willingale

Assistant Research Scientist

PhD (Plasma Physics), Imperial College London, UK, 2007

Ultra-high intensity laser-plasma interactions, particle acceleration, particle-in-cell simulation

Feng Zhang

Assistant Research Scientist

PhD (Nuclear Engineering and Radiological Sciences), University of Michigan, 2004

Room-temperature semiconductor detectors, ASIC readout systems and reconstruction of radiation interactions, next generation 3-D position sensitive CdZnTe detector array systems

EMERITUS FACULTY

A. Ziya Akcasu

Professor Emeritus

PhD (Nuclear Engineering), University of Michigan, 1963

Dynamics

Ronald F. Fleming

Professor Emeritus

PhD, Nuclear Engineering, University of Michigan, 1975

Neutron activation analysis, materials analysis using nuclear techniques, radiation measurements

Terry Kammash

Stephen S. Attwood Professor Emeritus of Nuclear Engineering and Radiological Sciences

PhD (Nuclear Engineering), University of Michigan, 1958

Fusion hybrid reactors for terrestrial and space power and propulsion applications

Glenn F. Knoll

Professor Emeritus

PhD (Nuclear Engineering), University of Michigan, 1963

Detection and spectroscopy of ionizing radiation, gamma ray imaging for medical and other applications, 3-D position sensing in gamma ray spectroscopy, nuclear detection and imaging.

Dietrich H. Vincent

Professor Emeritus

Dr. Rer. Nat. (Physics), Universitaet Goettinen, 1956

Radiation effects in materials, hydrogen (and helium) in metals, ion beam analysis, Mossbauer spectroscopy, positron lifetime spectroscopy

ADJUNCT FACULTY

Forrest Brown

Adjunct Professor

PhD (Nuclear Engineering), University of Michigan, 1981

Research and Development Scientist, Los Alamos National Laboratory

Research Professor, University of New Mexico

International reputation in Monte Carlo simulation and advanced computing

Frederick W. Buckman

Adjunct Associate Professor

PhD (Nuclear Engineering), Massachusetts Institute of Technology, 1970

President, Power Group, the Shaw Group, Inc.

Jeremy Busby

Adjunct Assistant Professor

PhD (Nuclear Engineering), University of Michigan, 2000

Research Scientist, Oak Ridge National Laboratory

Irradiation effects in metals for high temperature reactors, fusion reactors, and spacecraft reactors

Jack Davis

Adjunct Professor

PhD (Physics), Imperial College of Science, London, England, 1967

Science & Technology Chair, Naval Research Laboratory

Atomic physics, plasma spectroscopy, radiation transport, and non-LTE physics

Michael J. Flynn

Adjunct Professor

PhD (Nuclear Science), University of Michigan, 1975

Radiation imaging with emphasis on medical applications

Mitchell M. Goodsitt

Adjunct Professor

Also Professor, Radiological Sciences, Department of Radiology

PhD (Medical Physics), University of Wisconsin-Madison, 1982

Diagnostic x-ray and ultrasound imaging and quality control, such as development of a 3-D x-ray and 3-D ultrasound breast imaging system

Martha Matuszak

Adjunct Assistant Professor

Also Assistant Professor, Radiation Oncology, University of Michigan

PhD (Nuclear Engineering and Radiological Sciences), University Michigan, 2007

Imre Pazsit

Adjunct Professor

PhD (Reactor Physics), Roland Eötvös University, Budapest, Hungary, 1975

Ruth F. Weiner

Adjunct Professor

PhD (Chemistry), Johns Hopkins University, 1962

Sandia National Laboratories

Radiation risk analysis, radioactive waste management

VISITING FACULTY

Bo Chen

Visiting Assistant Professor

Fudan University, China

Invited by Professor Kimberlee Kearfott

Guang Ran

Visiting Assistant Research Scientist

Xiamen University, China

Invited by Professor Lu-Min Wang

Nam-il Tak

Visiting Associate Research Scientist

Korea Atomic Energy Research Institute

Invited by Professor Thomas Downar

Gang Yu

Visiting Associate Research Scientist

China Electric Power University, Beijing, China

Invited by Professor Lu-Min Wang

POST DOCTORAL RESEARCH FELLOWS

Parag Ahmedabadi (Professor Gary Was)

Andy Boucher (Professor Zhong He)

Manhee Jeong (Assistant Research Scientist Mark Hammig)

Geehyun Kim (Assistant Research Scientist Mark Hammig)

Brendan Kochunas (Professor Thomas Downar)

Wenjun Kuang (Professor Gary Was)

Syed Naeem (Professor Sara Pozzi)

Janelle Penisten (Professor Gary Was)

Bradley Sommers (Professor John Foster)

Peng Wang (Professor Gary Was)

Jinan Yang (Professor William Martin)

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Fabian Naab, Research Lab Specialist Associate
Mark Perreault, Senior Electronics Technician, Plasma Experimental Bay
Volkan Seker, Research Area Specialist Lead
Ovidiu Toader, Research Area Specialist Lead, Michigan Ion Beam Laboratory
Andrew Ward, Research Area Specialist Lead
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Caroline Joaquin, Department Administrator
Sheena Lewis, Administrative Assistant Associate
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Rose Prince, Administrative Assistant Associate
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Advisory Board

(September 1, 2012 – August 31, 2013)

| | |
|----------------------|---|
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| Charles A. Schrock | President and CEO Integrays Energy Group, Chicago, IL |
| Joseph Schumer | Head, Pulsed Power Physics Branch Naval Research Laboratory, Washington D.C. |
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