

ANNUAL REPORT

September 1, 2010 – August 31, 2011

NUCLEAR ENGINEERING AND
RADIOLOGICAL SCIENCES

University of Michigan

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Summary of Activities

This is the 14th 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 54 courses including special topics, independent study and doctoral research. Our undergraduate enrollment is stable at a very high level with 50 students registered in NERS250, Fundamentals of Nuclear Engineering and Radiological Sciences (our introductory sophomore level course) and 45 students in NERS311, (our junior level course). Our course offerings in fluid dynamics and thermal fluids are increasing with the addition of Associate Professor Annalisa Manera to our faculty. The NERS department awarded 45 BSE degrees and 9 Engineering Physics degrees. MS and MSE degrees were granted to 26 students. There were 19 Ph.D. graduates from NERS during this reporting period.

NERS Department continues to attract the highest quality students. Currently, NERS graduate students have earned dozens of graduate fellowships from the National Science Foundation, DoE, NNSA, NRC, DoD, and DHS. Undergraduate students garnered some 50 scholarships. NERS undergraduates and graduate students have also received numerous awards.

NERS faculty members continue to be recognized in the college, nationally and internationally. Ronald M. Gilgenbach was named the Chihiro Kikuchi Collegiate Professor by the UM College of Engineering. John E. Foster received the NASA Faculty Fellow Award and Karl Krushelnick was elected Fellow of the Optical Society of America.

Faculty research expenditures reached nearly 14 million dollars on some 140 research projects from government and industry. Clearly, the Nuclear Engineering and Radiological Sciences Department is on an outstanding trajectory.

Faculty Honors and Awards

(January 1, 2010 – December 31, 2010)

Alex F. Bielajew

Nuclear Engineering and Radiological Sciences
Faculty Achievement Award

John E. Foster

NASA
Faculty Fellow Award

Ronald M. Gilgenbach

University of Michigan College of Engineering
Chihiro Kikuchi Collegiate Professorship

Karl Krushelnick

Optical Society of America
Fellow

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

The University of Michigan American Nuclear Society (ANS) Student Section, formed in 1955, was the first student branch in the country. Since its inception, the branch has been involved in numerous activities to increase public awareness of the benefits of nuclear technology and its role in the future. One of the primary roles of the ANS student branch has been to provide professional development opportunities to students by organizing talks from the industry and by providing support to students attending national and regional ANS conferences, as well as hosting conferences of their own. Furthermore, the section organizes several social activities such as holiday parties, intramural sports teams, recreational activities, outreach, and community service.

Faculty Advisor: John Foster

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)

In the fall of 2008, a group of students collaborated to bring a student chapter of the Institute of Nuclear Materials Management (INMM) to the University of Michigan. Interest in the organization was first sparked when a few University of Michigan students attended the INMM annual meeting in July 2008. With the cooperation of other interested students, staff, and faculty a chapter was formed and a petition was submitted to the INMM Executive Committee. The petition and bylaws, and therefore group formation, were approved by the end of the Fall 2008 semester.

Formed in 1958, the mission of the INMM as a whole is to promote advancement and research in the area of nuclear materials management as well as implementing standards regarding professional ethics, education, and attainment of those engaged in the nuclear materials management field. Lastly, the organization strives to increase the distribution of information regarding the management of nuclear materials. The purpose of the student chapter is to foster and promote these international goals.

The University of Michigan student chapter intends to promote the INMM mission by hosting professional speakers, facilitating panels and discussions, as well as providing opportunities to further learn the importance of nuclear materials management firsthand.

Faculty Advisor: Sara Pozzi

President: Sonal Joshi

Vice President: Cassarah Brown

Secretary-Treasurer: Alexis Kaplan

UMEC Representative: Will Koehler

Publicity Chair: Steven Brown

Communications Chair: Marc Paff

Curriculum

CURRICULUM CHANGES

The following changes were made during AY 2010-2011:

- NERS 490 (Special Topics Course) was changed from 1-3 credits to 1-4 credits. The increase in credit hours will allow increased flexibility for the instructor. The change will allow 4 credit hour labs to be an option.
- NERS 583 (Applied Radiation Dose Assessment) was reduced from 4 credits to 3 credits. Reduction in credit hours will eliminate duplication of course material.
- NERS 586 (Applied Radiological Measurements) was reduced from 4 credits to 3 credits. Reduction in credit hours will eliminate duplication of course material. This course would still be allowed to fulfill the senior lab requirement; however students would have to increase NERS elective credits by 1 credit hour.

Four courses that have been taught as 490 and 590 (Special Topics Courses) were approved to be regular courses offered by Nuclear Engineering and Radiological Sciences. The three new courses are:

- NERS 320 – Basic Problems in Nuclear Engineering and Radiological Sciences
Pre-requisite: NERS 250
This course introduces junior-level NERS students to several different standard physical problems in nuclear engineering and radiological sciences, together with basic mathematical and numerical methods for solving the problems. In the course, each different physical problem will be introduced, mathematical equations for the problems will be derived, and solution techniques will be presented to solve the questions. The course is meant to prepare students for more advanced senior-level NERS courses.
- NERS 535 – Detection Techniques for Nuclear Nonproliferation
Pre-requisite: NERS 315 or equivalent
This laboratory course covers recent techniques for the detection, identification, and characterization of nuclear materials. It includes the study of Monte Carlo simulation and measurement techniques through hands-on experiments with isotopic gamma ray and neutron sources.
- NERS 546 – Thermal Fluids for Nuclear Reactor Safety Analysis
Pre-requisite: Concurrently with or prior to: NERS 441, ME 320, or CE 325 or equivalent or graduate standing
This course gives a broad overview of thermal-hydraulics/fluids for nuclear reactor safety. First, the basic principles of mass, energy, and momentum are discussed for nuclear applications.

Then group projects are performed using NRC computer codes for simulating light water and gas cooled reactors.

- NERS 573 – Plasma Engineering

Pre-requisites: NERS 471 or graduate standing

This course covers the theory and application of plasma concepts relevant to plasma engineering problems encountered in the workplace. Focus areas addressed include plasma propulsion, semiconductor processing, lighting, and environmental mitigation. Over the term, students will accumulate a toolbox of concepts and techniques directly applicable to “real world situations.”

Undergraduate program changes were approved for both the Nuclear Engineering and Radiological Sciences program and the Engineering Physics undergraduate program.

Nuclear Engineering and Radiological Sciences program changes consisted of the following:

- NERS 320 (Problems in Nuclear Engineering and Radiological Sciences) was approved as a required course.
- NERS 484 (Radiological Health Engineering) was changed from a required course to an elective.
- Nine credits of NERS electives are required. Students must now elect two courses from a list; NERS 484 – Radiological Health Engineering, NERS 471 – Intro to Plasma, NERS 462 – Reactor Safety Analysis, and NERS 421 – Nuclear Engineering Materials. Any remaining NERS elective credits will be the student’s choice.

Engineering Physics program changes consisted of the following:

- CEE 211 (Statistics and Dynamics) and ME 240 (Intro to Dynamics) will be dropped.
- Students will take Physics 401 (Intermediate Mechanics) unless they are pursuing Mechanical Engr for engineering electives. For Mechanical Engr students, CEE 211 or ME 240 will meet the Physics 401 requirement.
- ME 235 (Thermodynamics) will be dropped as a requirement.
- Physics 406 (Statistical and Thermal Physics) will be added as a requirement.
- ME 320 (Fluid Mechanics) will be dropped as a requirement. For students pursuing Mechanical Engr in Engineering Technical Electives, ME 320 will be advised and count as a Flexible Technical Elective.
- 7-10 credits will be added as Flexible Technical Electives. These credits will be 300 level or higher mathematics, physics, or engineering courses.
- Advanced Mathematics requirement will be reduced from 8 to 6 credits to be consistent with the mathematics courses offered.

COURSES OFFERED

COURSE NO.	COURSE TITLE	TERM	CREDITS
NERS 211/ENSCEN 211	Intro to Nuclear Engineering and Radiological Sciences	I, II	4
NERS 250	Fundamentals of Nuclear Engineering and Radiological Sciences	II	4
NERS 311	Elements of Nuclear Engineering and Radiological Sciences I	I	3
NERS 312	Elements of Nuclear Engineering and Radiological Sciences II	II	3
NERS 315	Nuclear Instrumentations Laboratory	II	4
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	2
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 and Radiological Sciences	All	TBA
NERS 499	Research in Nuclear Engineering and 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 Effects in Nuclear Materials	I	3
NERS 522	Nuclear Fuels	II (Alt Yrs.)	3
NERS 531	Nuclear Waste Management	II (Alt Yrs.)	3
NERS 543	Nuclear Reactor Theory II	I	3
NERS 551	Nuclear Reactor Kinetics	II	3
NERS 554	Radiation Shielding	II	4
NERS 561	Nuclear Core Design and Analysis I	II	3
NERS 562	Nuclear Core Design and Analysis II	III A	3
NERS 571	Intermediate Plasma Physics I	I	3
NERS 572/AppPhy 672	Intermediate Plasma Physics II	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 Materials	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 and Radiological Sciences II	All	TBA
NERS 599	Master's Project	All	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
NERS 799	Special Projects	All	1-6
NERS 990	Dissertation/Pre-Candidate	I, II, III IIIA-B	2-8 1-4
NERS 995	Dissertation/Candidate	I, II, III 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 NO.	TITLE	FA '10	WN '11	SP/SU '11
NERS 211	Intro to Nuclear Engineering and Radiological Sciences	66	92	
NERS 250	Fundamentals of Nuclear Engineering and Radiological Science		51	
NERS 311	Elements of Nuclear Engineering and Radiological Science I	45		
NERS 312	Elements of Nuclear Engineering and Radiological Science II		46	
NERS 315	Nuclear Instrumentation Laboratory		45	
NERS 421	Nuclear Engineering Materials	15		
NERS 425	Applications of Radiation		28	
NERS 441	Nuclear Reactor Theory I	56		
NERS 442	Nuclear Power Reactors		30	
NERS 462	Reactor Safety Analysis	35		
NERS 471	Introduction to Plasmas	41		
NERS 481	Engineering Principles of Radiation Imaging		32	
NERS 484	Radiological Health Engineering Fundamentals	53		
NERS 490	Special Topics in Nuclear Engineering and Radiological Sciences		74	
NERS 499	Research in Nuclear Engineering and Radiological Sciences	11	11	1
NERS 515	Nuclear Measurements Laboratory	14		
NERS 518	Advanced Radiation Measurements and Imaging	9		
NERS 521	Radiation Effects in Nuclear Materials	16		
NERS 543	Nuclear Reactor Theory II	15		
NERS 551	Nuclear Reactor Kinetics		25	
NERS 554	Radiation Shielding		27	
NERS 561	Nuclear Core Design and Analysis I		15	
NERS 572	Plasma Physics II		12	
NERS 575	Plasma Generation and Diagnostics Lab		24	
NERS 577	Plasma Spectroscopy	5		
NERS 578	Physical Processes in Plasmas	22		
NERS 580	Computation Projects in Radiation Imaging		22	
NERS 585	Transportation of Radioactive Materials	8		
NERS 590	Special Topics in Nuclear Engineering and Radiological Sciences	63	35	
NERS 599	Master's Project	5	7	
NERS 799	Special Projects	26	23	
NERS 990	Dissertation/Pre-Candidate	10	11	2
NERS 995	Dissertation/Candidate	64	56	6

Student Academics, Honors, and Employment

Undergraduate Scholarships for 2010-2011

American Nuclear Society Undergraduate Scholarship Award

Alexandra Niska Burja, Timothy Burke, Lee Gunderson, Patricia Schuster, Robert Steinbock

Budd Student Aid Fund

Alexandra Niska Burja, Daniel Chudnow, Drew Johnson, Derek Lax, Sean O'Neal, Jason von Ehr

Chihiro Kikuchi Scholarship

Alex Robinson, Eric Welch

Clarence E. Groesbeck Memorial Scholarship

Drew Johnson

Class of 1931E Scholarship

Marissa Mantey

College of Engineering General Fund

Alexandra Niska Burja, Tyler deVries-Wallace, Edward Harvey, Dyle Henning, Benjamin Van Eck

Colonel Jesse Vincent Memorial Scholarship

Michael Vargas

Exelon Corporation

Heeho Park

James D. Butt Scholarship Fund

Jeffrey Chenhall

James A. and Judith McDivitt Scholarship

Marissa Mantey

John P. and Nora B. Everett Recognition fund
Derek Lax

John S. King Scholarship Fund
Edward Harvey

Mildred Weed Goodrich Scholarship
Will Liu

National Academy for Nuclear Training Scholarship
Justin Ball, Navneet Gill

NERS Endowed Scholarship Fund
Alex Robinson, Eric Welch

NEUP Award
Marc Becchetti, Timothy Burke, Sean Carney, Lee Gunderson, Geoffrey Gunow,
Matthew Marcath, Sean O'Neal, Patricia Schuster, Robert Steinbock

Pearl Wheeler Scholarship in Engineering
Jeffrey Chenhall

Philip Henry Sheldon Endowment Scholarship
Jeffrey Chenhall, Tyler deVries-Wallace

Robert L. Richmond Endowed Scholarship
Heeho Park

Robert D. Scott Scholarship
Bianca Jones

Second Year Undergraduate Merit Scholarship
Alexandra Niska Burja, Daniel Chudnow, Drew Johnson, Derek Lax, Sean O'Neal, Jason
von Ehr

Simon Mandlebaum Scholarship
Lee Gunderson

Undergraduate Honors and Awards for 2010-2011

Henry Ford II Prize

Lee Gunderson, Mohammed Khalid Jawed

Outstanding Undergraduate Student Award-Engineering Physics

Chengyun Hua

Outstanding Undergraduate Student Award-NERS

Jeffrey Chenhall

Graduate Fellowships for 2010-2011

American Nuclear Society Graduate Awards

Anne Campbell, Travis Trahan

College of Engineering Dean's/Named Fellowship

Changyuan "Will" Liu, Michael Vargas

College of Engineering Regent's Fellowship

Adam Steiner

Directed Energy Professional Society

Matthew Franzi

Michigan Institute for Plasma Science and Engineering

Christopher McGuffey, Will Schumaker, Benjamin Yee, Peng Zhang

NASA Aeronautics Fellowship

Eric Gillman

NASA Graduate Student Research Program-Marshall Space Flight Center

Brandon Weatherford

National Academy for Nuclear Training in Nuclear Engineering Fellowship

Jason Storey

National Physical Sciences Consortium Fellowship

Sonal Patel, Jacob Zier

National Science Foundation Fellowship

Aimee Hubble, Jeffrey Katalenich

Natural Sciences and Engineering Research Council of Canada

Eva Sunny

Nuclear Regulatory Commission Fellowship

Michael Hirt, Daniel Walter, Diana Woodyatt, Artem Yankov

Rackham Engineering Award Fellowship

Margaret Bacon, Efrain Hernandez-Rivera, Timothy Watson

Rackham Presidential Scholarship

Bryan Toth, Emily Wolters

Rackham Graduate Student Research Grant

Peng Zhang

Rackham Pre-Doctoral Fellowship

Emily Wolters

U.S Department of Energy Admiral Hyman Rickover Graduate Fellowship

Bryan Toth

U.S. Department of Energy Computational Science Graduate Fellowship

Travis Trahan

U.S. Department of Energy Forensics Fellowship

Jennifer Dolan, Eric Miller

U.S. Department of Energy Nuclear Energy University Program

Tim Drzewiecki, Seth Johnson, Christopher Perfetti, Bruce Pierson, Aaron Wysocki

U.S. Department of Energy National Nuclear Security Administration Stewardship Science Graduate Fellowship

Matthew Gomez, Mark Norsworthy, Thomas Saller, Zachary Whetstone

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

David French, Aimee Hubble, Jeffrey Katalenich

Graduate Honors and Awards for 2010-2011

16th Annual ISSAT International Conference on Reliability and Quality in Design

Fariz Bin Abdul Rahman, "Fault-Tree Based Reliability Approach for Distribution System Analysis."

2010 Michigan Institute for Plasma Science and Engineering Graduate Student Symposium Best Presentation Award

Christopher McGuffey

2011 Innovations in Fuel Cycle Research:

1st Place, Advanced Materials

Michael McMurtrey, "Relationship between Localized Strain and Irradiation Assisted Stress Corrosion Cracking in an Austenitic Alloy"

2nd Place, Nuclear Materials Accountability and Control Instrumentation

Eric Miller, "Neutron and Gamma-Ray Cross-Correlation Measurements of MOX Fuel using Liquid Scintillators"

American Nuclear Society Student Design Competition, November 2010

Benjamin Betzler, Hiruy Hadgu, Christopher Lawrence, Matt Orians, Andrew Pavlou, Alex Poitrasson-Riviere

College of Engineering Distinguished Achievement Award

Christopher McGuffey

College of Engineering Distinguished Leadership Award

Travis Trahan, Yvan "Andy" Boucher

IEEE 2011 Holm Conference on Electrical Contact Young Investigator Award

"Contact Resistance with Dissimilar Materials: Bulk Contacts and Thin Film Contacts,"
Peng Zhang, University of Michigan-Ann Arbor; Y.Y. Lau, University of Michigan-Ann Arbor; W. Tang, Air Force Research Laboratory, United States; M.R. Gomez, Sandia National Laboratories, United States; D.M. French, Air Force Research Laboratory, United States; J.C. Zier, Naval Research Laboratory, United States; R.M. Gilgenbach, University of Michigan-Ann Arbor

TMS 2011 Microstructural Processes in Irradiated Materials Symposium:

Outstanding Oral Presentations

Anne Campbell, Cheng Xu

Outstanding Poster Presentation

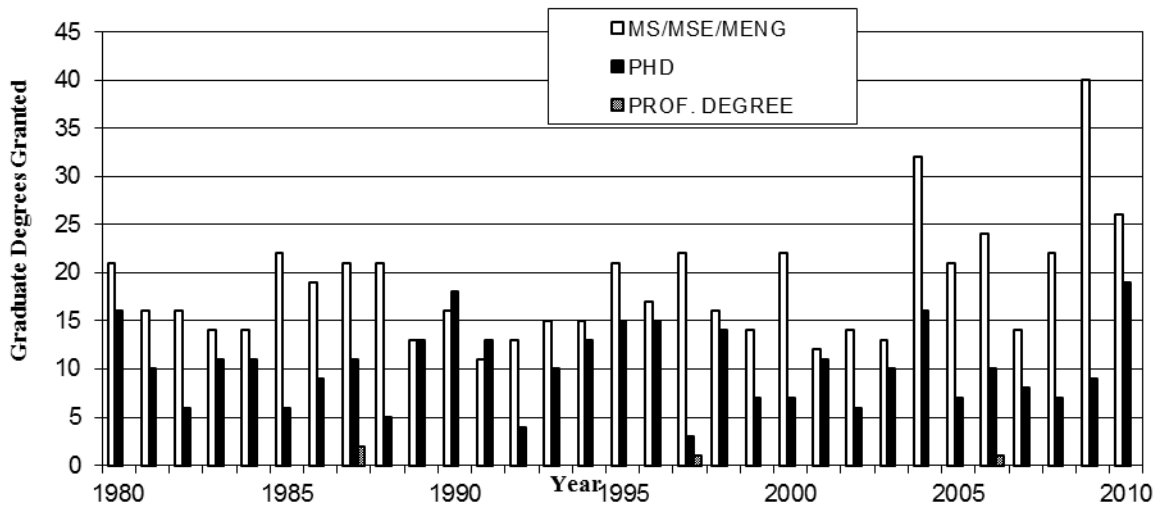
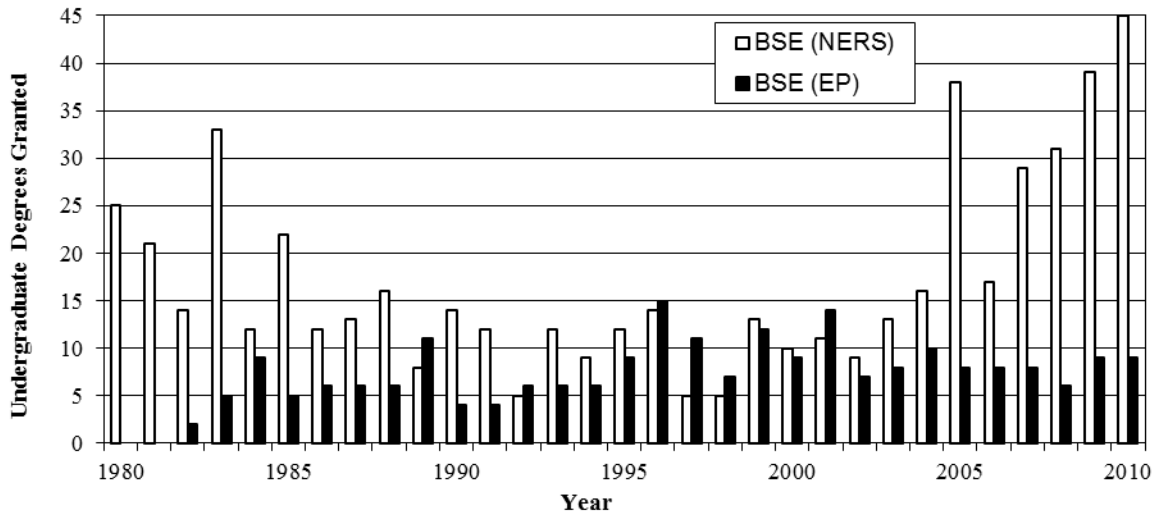
Janelle (Penisten) Wharry

DEGREES AWARDED BY ACADEMIC YEAR

September 2010 – August 2011

Degree	Number
BSE in Nuclear Engineering and Radiological Sciences	45
BSE in Engineering Physics	9
MSE and MS in Nuclear Engineering and Radiological Sciences*	26
PhD in Nuclear Engineering and Radiological Sciences, Nuclear Science	19
Professional Degree (Nuclear Engineer)	0

*12 students continuing in doctoral program



DOCTORAL THESES TITLES

For Degrees Conferred September 2010 – August 2011

Name	Thesis Title	Advisor
Pantip Ampornrat	Determination of Oxidation Mechanisms of Ferritic-Martensitic Alloys in Supercritical Water	Gary S. Was
Stephen Anderson	Event Classification for 3-D Position Sensitive Semiconductor Detectors	Zhong He
Paul Barton	Silicon Photomultipliers for Scintillation Detection Systems	David K. Wehe
Edward Cruz	Peer-to-Peer Locking of Magnetrons	Ronald M. Gilgenbach Y.Y. Lau
Benjamin Collins	Multiscale Methods for Nuclear Reactor Analysis	Thomas J. Downar
David French	Investigations of Novel Configurations for High Power Microwave Generation	Ronald M. Gilgenbach Y.Y. Lau
Matthew Gomez	Experimental Examination of Plasma Formation and Current Loss in Post-Hole Convoluters	Ronald M. Gilgenbach Y.Y. Lau
John Harvey	Performance of Thermoluminescent Dosimeters Under As-Deployed Conditions	Kimberlee J. Kearfott
Shu-Hui Hsu	Evaluations of Dosimetric Uncertainties and Transit Dosimetry Feasibility in Pulmonary Stereotactic Body Radiotherapy (SBRT)	Kimberlee J. Kearfott
Christopher McGuffey	Studies of Laser Guiding and Electron Injection in a High Power Laser Wakefield Accelerator	Karl M. Krushelnick Alexander Thomas
Sy Strange	Nanocomposite Scintillators for Neutron Capture Measurements	James P. Holloway
Athi Varuttamaseni	Bayesian Network Representing System Dynamics in Risk Analysis of Nuclear Systems	John C. Lee
Christopher Wahl	Imaging, Detection, and Identification Algorithms for Position-Sensitive Gamma-Ray Detectors	Zhong He
Weiyi Wang	Techniques and Applications of Compton Imaging for Position-Sensitive Gamma-Ray Detectors	Zhong He
William West	Investigations into the Optically Stimulated Luminescence Response of Various Materials	Kimberlee J. Kearfott
Emily Wolters	Hybrid Monte Carlo – Deterministic Neutron	William R. Martin

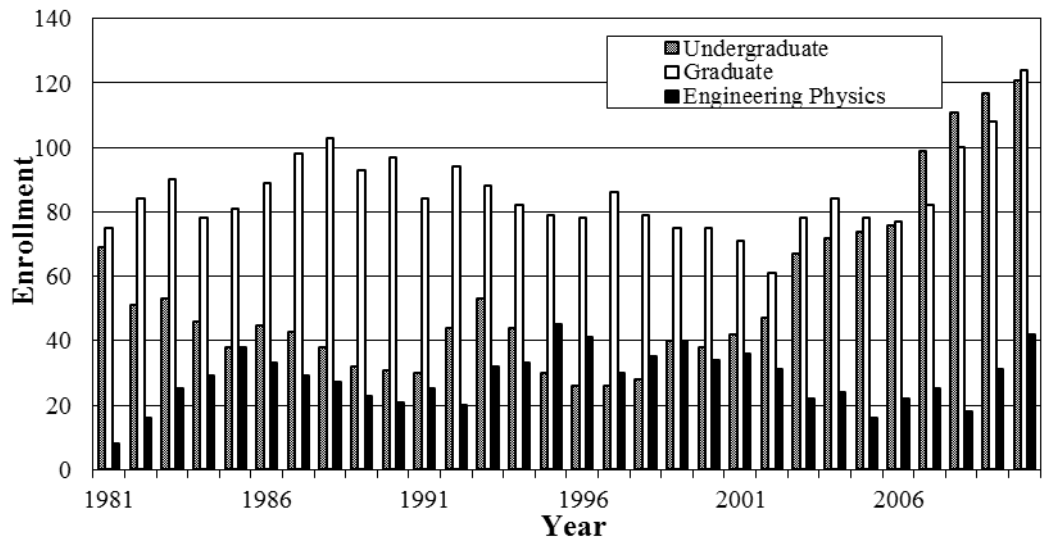
	Transport Methods Using Nonlinear Functionals	
Jinan Yang	A Functional Monte Carlo Method for K-Eigenvalue Problems	Edward Larsen
Jacob Zier	Ablation Dynamics and Instabilities of Metallic Plasmas Generated Using Mega-Ampere-Scale Current Drivers	Ronald M. Gilgenbach Y.Y. Lau

Theses in Progress September 2011-August 2012

Name	Thesis Title	Advisor
Stephen Asbury	Multi-Grid Algorithms for Optimal Radiation Shield Design	James P. Holloway
Eric Gillman	Cathode-Spot Ejected Ceramic Powder Resulting in Plasma Electron Depletion and Applications for Communications Blackout Mitigation	John E. Foster
Manhee Jeong	Si-Based Delay Line 3D Position Radiation Detector	David K. Wehe
Seth Johnson	Anisotropic Diffusion Approximations for Time-Dependent Particle Transport	Edward Larsen
William Kaye	Reconstruction of Energy and 3D Position in Room Temperature Semiconductor Detectors	Zhong He
Adrienne Lehnert	A Flag-Based Algorithm for Explosives Detection in Sea-Land Cargo Containers Using Active Neutron Interrogation	Kimberlee J. Kearfott
Tiberius Moran	Modeling Turbulent Radiative Shocks with Applications to High-Energy-Density Physics and Astrophysics	James P. Holloway
Miesher Rodrigues	Pulse Mode Operation of 3D-Position-Sensitive CdZnTe Pixelated Semiconductor Detectors Under High-Flux	Zhong He
Bryan Toth	Adaptive Coarse Mesh Eigenvector Extrapolation for Monte Carlo Neutron Transport Source Convergence Acceleration	William R. Martin
Andrew Ward	A Fully Implicit Newton-Krylov Method for the Couple Field Solution in the AGREE/PARCS Code System	Thomas P. Downar
Brandon Weatherford	Development and Study of an Electron Cyclotron Resonance Waveguide Plasma Cathode for Electric Propulsion Applications	John E. Foster
Yuefeng Zhu	Digital Signal Processing Methods for Pixelated 3D Position Sensitive Room-Temperature Semiconductors Detectors	Zhong He

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



EMPLOYMENT STATISTICS AND CONTINUING EDUCATION

Place of First Employment of Graduates September 2010 – August 2011

Undergraduate Students

Employer	BSE Students
Bechtel	Megan Brown
DTE Energy	Nathan DeKett
	Dallas Manning
	Nathan Pratt
Entrepreneurial	Abu Shakil
Ford Motor Company	Bianca Jackson
New World Environmental	Ryan Penney
Westinghouse	Daniel Vincent
University of Michigan Hospital – Radiation Oncology	Tara Hackel
U.S. Navy	Matthew Frantz
	Geoffrey Jablonski
Unknown	Brian Chung
	Joseph Krotkiewicz
	Christopher Noelting
	John Rodeman
	Caitlin Schultz

University	BSE Students
MIT	Justin Ball
Stanford University	Chengyun Hua
University of California-Berkeley	Patricia Schuster
	Guanheng Zhang
University of Florida	Janine Lambert
University of Michigan, NERS	Marc Becchetti
	Sean Carney
	Alexander Cusick
	Erin Dughie
	Navneet Gill
	Blake Griffin
	Michael Hamel
	Dyle Henning
	Joseph Karbowski
	Kyle Kissoff
	Jonathon Koglin

	Joseph Lelli
	Jack Linkous
	Andrew McKelvey
	Heeho Park
	Paul Saunders
	Robert Steinbock
	Brice Taylor
	Benjamin VanEck
	Kyle Weinfurther
	Brian Wieger
	Benjamin Wu
University of Michigan, Physics	Michael Gebbraro
University of Michigan, School of Information	Michael Fuerstnau
University of Wisconsin-Madison	Trevor Anderson
	Jeffrey Chenhall
	Brian Mackie-Mason
	Eric Relson
Other Graduate Schools	Kyle Antonini
	Colin Hilligas
	Jinhong Qu
	Carlos Tobon
	Srikanth Veluvolu

Graduate Students

Employer	MS/MSE Students
Brazilian Navy	Claudio Andrzejewski
General Dynamics, Electric Boat	Sarah Williams
Holtec International	Hamdi Fariz
Knolls Atomic Power Laboratory	David Genevich
	Andrew LaCharite
Nuclear Regulatory Commission	Jakob Steffes
Sciencetech	Michael Hirt
University of Michigan, NERS	Mark Bourne
Unknown	Michael Nagy
URS Safety Management Solutions	Jason Storey
West Physics Consulting	David Howard

Employer	PhD Students
Air Force Research Laboratory	David French
Argonne National Laboratory	Emily Wolters
Brookhaven National Laboratory	Athi Varuttamaseni
Bureau of Nuclear Safety Regulations, Thailand	Pantip Ampornrat
Lawrence Berkeley National Laboratory	Paul Barton
Los Alamos National Laboratory	Stephen Anderson
	Sy Strange
Naval Research Laboratory	Jacob Zier

RM Technologies, Inc	Edward Cruz
Sandia National Laboratory	Matthew Gomez
University of Michigan, NERS	Ben Collins
	Jinan Yang
University of Michigan Hospital, Radiation Oncology	Shu-Hui Hsu
West Physics Consulting	John Harvey
	W. Geoffrey West
Yale University	Christopher Wahl

University (Continuing PhD)	MS/MSE Students
University of California-Berkeley	Kyle McMillan
University of Michigan, AERO	Wensheng Huang
	Adam Shabshelowitz
University of Michigan, NERS	Jeffrey Katalenich
	Sonal Patel
	J. Kyle Polack
	Jason Jaworski
	Michael McMurtrey
	Matt Orians
	Kapil Sawlani
	Travis Trahan
	Aaron Wysocki
	Cheng Xu
	Hao Yang
	Peng Zhang

INTERNSHIPS

Undergraduate

Brian Mackie-Mason	Air Force Research Laboratory	NM
Tyler deVries-Wallace	Brookhaven National Laboratory	NY
Matthew Marcath	DC Cook Power Plant	MI
Daniel Chudnow	Defense Nuclear Facilities Safety Board	DC
Benjamin Baumgarten	DTE Energy	MI
Michael Jarrett	DTE Energy	MI
Andrew Winters	GIEU Program	China
Hudson Rowland	Hitachi-GE	Japan
Adam Schutt	Hitachi-GE	Japan
Timothy Burke	Knolls Atomic Power Laboratory	NY
Sean Carney	Knolls Atomic Power Laboratory	NY
Justin Ball	Lawrence Livermore National Laboratory	CA
Jeffrey Chenhall	Lawrence Livermore National Laboratory	CA
Sean O'Neal	Lawrence Livermore National Laboratory	CA
Eric Relson	Los Alamos National Laboratory	NM
Brian Chung	Materials Research Center	Germany
Navneet Gill	National Institute of Science and Technology	DC
Erin Dughie	Naval Research Laboratory	DC
Michael Hamel	Naval Research Laboratory	DC
Marissa Mantey	Nuclear Regulatory Commission	IL
Jack Linkous	Sandia National Laboratory	NM
Patricia Schuster	Sandia National Laboratory	CA
Kyle Weinfurther	Sandia National Laboratory	CA
Ryan Penney	Savannah River Power Plant	GA
Geoffrey Gunow	Schlumberger	MA
Jonathan Rosette	Study Abroad – UNIST	Korea
Theresa Willson	Study Abroad – Berlin	Germany
Marc Jankowski	University of Michigan, EECS	MI
Chengyun Hua	University of Michigan, ME	MI

Graduate

Fariz Bin Abdul Rahman	Brookhaven National Laboratory	NY
Dan Walter	Brookhaven National Laboratory	NY
Zachary Whetstone	Brookhaven National Laboratory	NY
Matt Orians	Hill Air Force Base	UT
Travis Trahan	Idaho National Laboratory	ID
Jennifer Dolan	Idaho National Laboratory	ID
Geoff Greening	Kirtland Air Force Base	NM
Douglas Fynan	Korea Atomic Energy Research Institute	Korea
Christopher Lawrence	Lawrence Livermore National Laboratory	CA
Eric Baker	Los Alamos National Laboratory	NM

Andrew Pavlou	Los Alamos National Laboratory	NM
Eva Sunny	Los Alamos National Laboratory	NM
Mitch Young	Los Alamos National Laboratory	NM
Ben Yee	NASA Glenn Research Center	
Chris Perfetti	Oak Ridge National Laboratory	TN
Kendra Keady	Pacific Northwest National Laboratory	WA
Jonathan Wierschke	Pacific Northwest National Laboratory	WA
Efrain Hernandez-Rivera	Sandia National Laboratory	
Fariz Bin Abdul Rahman	Westinghouse	PA

EMPLOYMENT PATTERNS OF GRADUATES

New Graduates: September 2010 – August 2011

	BS	MS/MSE	PhD
Federal Government			
Department of Defense			
Air Force National Laboratory			1
Armed Forces	2		
Naval Research Laboratory			1
Department of Energy			
Argonne National Laboratory			1
Brookhaven National Laboratory			1
Knolls Atomic Power Laboratory		3	
Lawrence Berkeley National Laboratory			1
Los Alamos National Laboratory			2
Oak Ridge National Laboratory			2
Sandia National Laboratory			1
Nuclear Regulatory Commission		1	
Electrical and Nuclear Utilities			
DTE Energy	3		
Scientech		1	
Nuclear Reactor Manufacturers			
Bechtel	1		
Westinghouse	1	1	
Consulting Firms			
West Physics Consulting			2
URS Safety Management Solutions		1	
Entrepreneurial	1		
Other Industrial and Medical Organizations			
Ford Motor Company	1		
General Dynamics Electric Boat		1	
Holtec International		1	
New World Environmental	1		
RM Technologies			1
University of Michigan Hospital-Radiation Oncology	1		1
Foreign Governments			
Academic Institution: Grad, Post Doc, and Faculty			2
Military		1	
Academic Institutions: Grad, Post Doc, and Faculty			
MIT	1		
Stanford University	1		
University of California-Berkeley	2	1	
University of California-San Diego			1

University of Florida	1		
University of Michigan, AERO		2	
University of Michigan, NERS	22	13	3
University of Michigan, Physics	1		
University of Michigan, School of Information	1		
University of Wisconsin-Madison	4		
Unknown Graduate Schools	5		
Yale University			1
Returned to Home Country and Unknown	5	1	
TOTALS	54	27	21

41-Year Summary: September 1970 – August 2011

	BS	MS	M ENG	PhD	Pro
Federal Government					
Armed Forces	68	22	1	8	
Civilian Employees	5	3		17	
Department of Commerce				7	
Department of Defense			4		
Department of Energy	12	52		113	
Department of Transportation				2	
Environmental Protection Agency			2		
NASA		1			
Nuclear Regulatory Commission		5	1		1
Waste Management Federal Services		1			
Electrical and Nuclear Utilities	88	47	1	9	
Nuclear Reactor Manufacturers	44	51		21	1
Architecture-Engineering Firms	19	29	1	5	
Consulting Firms	10	7	6	12	
Entrepreneurial	2				
Other Industrial and Medical Organizations	31	48	5	62	
Foreign Governments	1	16	3	15	4
Academic Institutions					
Faculty and Staff	7	7	2	59	
Graduate Schools and Post Doctorate Work	445	413	10	55	
Employment Outside the Profession	17	10		2	
Returned to Home Country and Unknown	115	45	7	30	3
Fulbright Award	1				
TOTALS	865	757	43	417	9

DATE	SPEAKER	TITLE
Sept. 17	Ron Gilgenbach University of Michigan, NERS	Department Welcome
Sept. 24	Ehsan Samei Duke University	The Role and Relevance of Radiation Science to Medical Imaging
Oct. 1	Han Gyu Joo Seoul National University, Korea	The Coarse Mesh Finite Difference Method and its Role in Computational Reactor Physics
Oct. 8	Jim Lund Sandia National Laboratory	Radiation Detector Development at Sandia National Laboratories
Oct. 15	No Colloquium	Fall Study Break – Oct. 18-19
Oct. 22	Shawn Burns Sandia National Laboratory	Severe Reactor Accident Progression and Off-Site Consequence Analysis
Oct. 29	No Colloquium	NERS Career Fair
Nov. 5	Zulfikar Najmudin Imperial College, London	Acceleration of Particles Driven by Lasers
Nov. 12	Hany Abdel-Khalik NC State University	Uncertainty Management for Nuclear Systems Analysis Codes: Current Status & Path Forward
Nov. 19	Steve Howe Idaho National Laboratory	Nuclear Thermal Rockets
Nov. 26	No Colloquium	Thanksgiving Break
Dec. 3	Ben Forget MIT	Beyond Multigroup: An Alternative for the Energy Treatment in Radiation Transport
Dec. 10	Steven Aumeier Idaho National Laboratory	Carbon Management, Energy Security, and the Future for Nuclear Energy

DATE	SPEAKER	TITLE
Jan. 14	George Schmidt NASA	Nuclear Systems for Space Power and Propulsion
Jan. 21	Brian Wirth University of Tennessee	Multiscale Investigation of Irradiation Effects in Fuel, Clad, and Structural
Jan. 28	Jeremy C. Polf Department of Radiation Physics, MD Anderson Cancer Center	Prompt Gamma Ray Imaging During Proton Radiotherapy for Assessment of Treatment Delivery and Patient Response
Feb. 4	David Miller American Electric Power, Cook Nuclear Power Plant	Mitigation of Deposition of Co-60 in Westinghouse PWRs Piping to Achieve Lowest U.S. Refueling Outage Occupation Dose
Feb. 11	Linn Hobbs MIT	Topological Approaches to Structure and Defect Identification in Amorphous and Amorphizing Solids
Feb. 18	Michael Demkowicz MIT	Atomic-Scale Design of Metal-Metal Interfaces for Radiation Resistance
Mar. 5	No Colloquium	Winter Break
Mar. 11	Bill Martin University of Michigan, NERS	CASL – The Multi-Institutional DOE Initiative to Build a Virtual Reactor
Mar. 25	Farhat Beg UC San Diego	Generation and Transport of Hot Electrons in Fast-Ignition Fusion Experiments
Apr. 1	Ronnie Shepherd LLNL	Stars and Plasmas: Laboratory Experiments to Help Understand the Secrets of Stellar Interiors
Apr. 8	Chang Hyo Kim Seoul National University	Uncertainty Analysis by Monte Carlo Method
Apr. 15	Veena Tikare Sandia National Laboratories	Numerical Simulation of Nuclear Fuel Structure and Behavior at the Meso-Scale

Research Activities

FISSION SYSTEMS AND RADIATION TRANSPORT

“PARCS Code Development for LWR”

PI: Thomas Downar

Sponsor: Nuclear Regulatory Commission

\$320,000/2010

“HTR Development of PARCS Code”

PI: Thomas Downar

Sponsor: Nuclear Regulatory Commission

\$280,000/2010

“Basic Research on HTR”

PI: Thomas Downar

Sponsor: Department of Energy, Nuclear Regulatory Commission

\$210,000/2010

“HTR Methods Development”

PI: Thomas Downar

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

\$150,000/2010

“Advanced Methods Development for the HTR”

PI: Thomas Downar

Sponsor: ANL

\$98,000/2010

“Analysis of TRU Burning in BWR”

PI: Thomas Downar

Sponsor: EPRI, Hitachi

\$145,000/2010

“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.

“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 high temperature reactors, 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.

“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.

“Creation a Full-Core HTR Benchmark with the Fort St. Vrain Initial Core and Validation of the DHF Method with Helios for NGNP Configurations”

PI: William Martin, Co-PI: John Lee

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

\$421,288; 10/1/2009 – 9/30/2011

This project will develop a benchmark computer model based on the physics test data from the Fort St. Vrain high-temperature gas-cooled reactor. The Monte Carlo capability developed under a previous NERI grant will provide the basis for the project work.

B.R. Betzler, W. R. Martin, and J. C. Lee, "MCNP5 Analysis of the Fort St. Vrain High-Temperature Gas-Cooled Reactor," Trans. Am. Nucl. Soc. 102, 515 (2010).

B. R. Betzler, E. E. Sunny, J. C. Lee, W. R. Martin, "Coupled Nuclear-Thermal-Hydraulic Calculations for Fort St. Vrain Reactor," to be presented at the 14th International Topical Meeting on Nuclear Reactor Thermalhydraulics, NURETH-24 (2011).

"Bayesian Network for Reliability Analysis of Dynamical Systems"

PI: John Lee

Sponsor: Idaho National Laboratory

\$29,632; 6/22/2010 – 9/30/2010 (Part I)

"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

"CASL – Energy Innovation Hub for Nuclear Energy Modeling and Simulation"

PI: William Martin, Co-PI: John Lee

Sponsor: Department of Energy, Subcontract through ORNL

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

A. Hoffman, B. Kochunas, J. C. Lee, "Parallelized Adaptive Time Stepping Using the Step Doubling Method in DeCart," to be presented at the American Nuclear Society Conference, June 2011.

"Adaptation of the SHARP Modeling and Simulation Capability for VHTR Development and Design"

PI: John Lee, Thomas Downar, Edward Larsen, and William Martin

Sponsor:

\$100,000; 3/15/2010 – 12/31/2010

In continuation of the ANL-VHTR grant we had during AY 2008-09, the project concentrated on implementing a fuel depletion capability into the DeCART code and performing benchmark calculations for prismatic VHTR designs.

G. Yesilyurt, K. Banerjee, E. de Villele, J. C. Lee, and W. R. Martin, "Coupled Nuclear-Thermal-Hydraulic Calculations for VHTR," *Trans. Am. Nucl. Soc.* **102**, 519 (2010).

"PHEV Pilot Proposal"

PI: John Lee, Co-PI: Gary Was

Sponsor: Michigan Public Service Commission

\$5,000,000; 9/1/2008 – 12/31/2010

As part of the multi-disciplinary grant aimed at developing a technical basis for establishing the State of Michigan as the hub for PHEVs, the project leveraged the DOE project on technical challenges of PHEVs to develop methods for the evaluation of the reliability of the DTE electric grid subject to the PHEV deployment. The effort involves the analysis of outage data for the DTE distribution system circuits and development of strategies to introduce PHEV charging into DTE grid with minimal impact. We have developed a novel method of using customer data to determine the system reliability.

F. A. Rahman, A. Varuttamaseni, T. Briley, H. Asgeirsson, N. Carlson, T. Tran, M. Kinter-Meyer, and J. C. Lee, "Fault-Tree Based Reliability Approach for Distribution System Analysis," *Int. Conf. on Reliability and Quality in Design (RQD '10)* (2010).

MATERIALS

“Structure, properties and relaxation of shear bands in metallic glasses”

PI: M. Atzmon

Sponsor: National Science Foundation, Division of Materials Research
\$426,898; 7/1/2006 – 6/30/2011

In crystalline solids, the atomic scale structure has been understood for a long time. On the other hand, the structure of some nonequilibrium materials is still the subject of current research. In amorphous materials, the density is variable and is a function of the thermomechanical history. Structural relaxation has a significant effect on the properties. Since mechanical deformation introduces shear bands whose density is lower than that of the matrix, it is important to understand their structure and effect on mechanical and transport properties. In recent work, the anelastic deformation of metallic glasses has been used to characterize defects produced by permanent deformation. One significant result is the existence of at least four distinct types of anelastic sites, in contrast to the two types generally-assumed in the glass-science community.

“Nuclear Forensics Junior Faculty Award Program”

PI: Mike Hartman

Sponsor: Department of Homeland Security
\$375,000; 8/1/2010 – 7/31/2013

“Accelerator based study of irradiation creep of pyrolytic carbon for the TRISO fuel of VHTR”

PI: Lumin Wang, Co-PI: Gary Was

Sponsor: Department of Energy, Nuclear Engineering Research Initiative (NERI)
\$615,851; 6/1/2006 – 6/30/2010

Pyrolytic carbon (PyC) is one of the structural materials in the TRISO fuel particles that will be used in the next generation of gas-cooled very-high-temperature reactors. When the TRISO particles are under irradiation, creep of the pyrocarbon layers can cause radial cracking leading to catastrophic particle failure. Therefore, a fundamental understanding of the creep behavior of PyC during irradiation is required to predict the overall fuel performance.

The primary objective of this project is to characterize the creep behavior of PyC through a systematic program of accelerator-based proton irradiation and *in-situ* measurements under stress at various temperatures between 400⁰ C and 1,200⁰ C. Test data will be analyzed to determine creep coefficients, which will then be correlated to existing coefficients measured under neutron irradiation. In addition, initial experiments on the transport of select fission products (e.g., Ag and Sr) in PyC under irradiation

and stress will be conducted by implanting ions into the sample surface. The PyC microstructure will be studied with advanced analytical transmission electron microscopy (TEM).

“Nanostructure patterning under energetic particle irradiation”

PI: Lumin Wang

Sponsor: Department of Energy, Office of Basic Energy Sciences

\$517,493; 12/1/2006 – 5/30/2010

\$180,000; One year addition

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

PI: Lumin Wang, Co-PI: Mike Hartman

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

\$931,603; 9/1/2010 – 8/31/2013

“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

“Ion Irradiation-Induced Degradation of Reactor Structural Materials”

PI: Gary Was

Sponsor: Institute for Nuclear Safety Systems

\$150,000; 3 years

“Cladding and Materials for Advanced Nuclear Energy Systems”

PI: Gary Was

Sponsor: Department of Energy, Office of Nuclear Energy, Science and Technology NERI consortium

\$3,000,000; 3 years

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

“Radiation-Induced Segregation and Phase Stability in Candidate Alloys for the Advanced Burner Reactor”

PI: Gary Was

Sponsor: Department of Energy, Office of Nuclear Energy, Science and Technology NERI

\$750,000; 3 years

The primary objective of this project is to investigate the effect of irradiation on the segregation and phase stability in candidate alloys proposed for application as structural materials for transmutation in the advanced burner reactor. The project will focus on two ferritic-martensitic alloys, and will also include an experimental ODS alloy and an advanced austenitic alloy in a coordinated experimental and modeling effort to investigate the complex electronic-magnetic-elastic interactions between Cr and radiation induced defects controlling radiation induced segregation in F-M alloys. This project will provide a mechanistic understanding of segregation and phase stability that can be used to develop predictive irradiation performance models. It will also provide data, against which forthcoming in-reactor irradiations can be interpreted and understood, as well as guidance and direction for those experiments.

This proposal is centered on the two F-M alloys; T91 and HT-9 as both are viable candidates for the ABTR and form the basis for more advanced alloys for the ABR, and will focus on Cr RIS and phase stability in these alloys under irradiation, as these are potentially limiting processes for their application. However, the full, irradiated microstructure needs to be considered as the radiation effects processes are interrelated. Also included in the work scope is a ferritic ODS alloy because of its superior irradiated microstructure stability and strength. In addition, an advanced austenitic alloy, D9, is included because it is the leading austenitic alloy, and yet it potentially can suffer from RIS (of Si) and the formation of deleterious phases (silicides) that could affect performance. Experiments will be conducted by proton and heavy ion irradiation over the dose range 3-1000 dpa and the temperature range 350-550°C with the inclusion of He at the highest doses. Analysis of RIS, phase microstructure, dislocation microstructure, and hardening will be conducted on all conditions to provide a systematic set of data.

The modeling tasks will involve ab-initio electronic structure calculations to investigate the configuration-dependent binding and migration energies of Cr with vacancy and interstitial defects, including small clusters. These values will enable development of atomistic-based kinetic Monte Carlo models similar to those employed previously to evaluate He diffusion in Fe and specifically designed to investigate the Cr diffusivity by interstitial and vacancy mechanisms. The RIS tendencies of Cr in F-M alloys will be predicted as a function of temperature and dose, based on migration mechanisms and energies obtained from ab-initio calculations. The outcomes of this modeling task will be mechanistic interpretation of the complex Cr RIS behavior, and key diffusional parameters for both continuum level rate theory models and the development predictive RIS models of Cr and Si in F-M alloys.

The combined experimental-modeling program is designed to provide a set of data on the behavior of RIS, phase microstructure, dislocation microstructure, and hardening as a function of dose and temperature in the range 350-550°C and 3-100 dpa. This data will be used to benchmark RIS and dislocation microstructure models developed from ab-initio electronic structure calculations and extended to kinetic Monte Carlo and continuum rate theory (MIK) models.

“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.

“Sodium Compatibility for Advanced Reactor Materials”

PI: Gary Was

Sponsor: Department of Energy, Oak Ridge National Laboratory

\$225,000; 2 years

“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

PLASMAS AND FUSION

“An investigation of plasma discharge ignition in bubbles in water applications for the treatment of contaminated water”

PI: John Foster

Sponsor: National Science Foundation

\$60,000; 9/1/2009 – 9/1/2010

“An investigation of plasma formation in electromechanically driven bubbles”

PI: John Foster

Sponsor: National Science Foundation

\$288,000; 8/1/2010 – 8/1/2013

“High Pressure Plasmas for Materials Processing”

PI: John Foster

Sponsor: 3M

\$70,000; 1/2010 – 12/2010

“ECR Plasma Neutralizer”

PI: John Foster

Sponsor: NASA

\$90,000; 8/1/2009 – 8/1/2010

“Microwave driven magnetic cusp plasma thruster”

PI: John Foster

Sponsor:

\$5,000; 4/1/2009 – 5/31/2010

“Non-intrusive measurement of electric field in pulsed ns discharge for plasma aided combustion”

PI: John Foster

Sponsor: NASA

\$90,000; 8/1/2009 – 8/1/2012

“50 Cm High Power Ion Thruster”

PI: John Foster
Sponsor: NASA
\$47,000; 1/1/2010 – 1/1/2011

“Water purification by high voltage, ns plasma”

PI: John Foster
Sponsor: NASA
\$5,000; 9/30/2010 – 12/30/2010

“LCIF measurements on low pressure microwave generated discharges”

PI: John Foster
Sponsor: Sandia National Laboratory
\$10,000; 7/2010 – 12/2010

“Ultra-short pulse laser for advanced cathodes and windows for high power microwave sources”

PI: Ronald M. Gilgenbach, Co-PI: Y.Y. Lau and John Foster
Sponsor: Air Force, Office of Scientific Research
\$175,000; FY 2010

“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.

Y. Y. Lau, J. W. Luginsland, K. L. Cartwright, D. H. Simon, W. Tang, B. W. Hoff, R. M. Gilgenbach, “A re-examination of the Buneman-Hartree condition in a cylindrical smooth-bore relativistic magnetron,” *Phys. Plasmas*. **17**, 033102 (2010).

D. M. French, B. W. Hoff, Y. Y. Lau, R. M. Gilgenbach, “Negative, positive, and infinite mass properties of a rotating electron beam,” *Appl. Phys. Lett.* **97**, 111501 (2010).

I. M. Rittersdorf, Y. Y. Lau, J. C. Zier, R. M. Gilgenbach, E. J. Cruz, J. W. Luginsland, “Temporal and spatial locking of nonlinear oscillators,” *Appl. Phys. Lett.* **97**, 171502 (2010).

“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

Y. Y. Lau, J. W. Luginsland, K. L. Cartwright, D. H. Simon, W. Tang, B. W. Hoff, R. M. Gilgenbach, “A re-examination of the Buneman-Hartree condition in a cylindrical smooth-bore relativistic magnetron,” *Phys. Plasmas*. **17**, 033102 (2010).

D. M. French, B. W. Hoff, Y. Y. Lau, R. M. Gilgenbach, “Negative, positive, and infinite mass properties of a rotating electron beam,” *Appl. Phys. Lett.* **97**, 111501 (2010).

I. M. Rittersdorf, Y. Y. Lau, J. C. Zier, R. M. Gilgenbach, E. J. Cruz, J. W. Luginsland, “Temporal and spatial locking of nonlinear oscillators,” *Appl. Phys. Lett.* **97**, 171502 (2010).

B. W. Hoff, M. Franzi, R. M. Gilgenbach, Y. Y. Lau, “Three-dimensional simulations of magnetic priming of a relativistic magnetron,” *IEEE Trans. Plasma Sci.* **38**, 1292 (2010).

“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

P. Zhang, Y. Y. Lau, “Scaling laws for electrical contact resistance with dissimilar materials,” *J. Appl. Phys.* **108**, 044914 (2010).

P. Zhang, Y. Y. Lau, R. M. Gilgenbach, “Minimization of thin film electrical contact resistance,” *Appl. Phys. Lett.* **97**, 204103 (2010).

“Ionization Dynamics of Wire Z-Pinches”

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

Sponsor: Sandia National Laboratories

\$140,000; 1/1/2008 – 9/30/2010

The purpose of this work is to perform detailed diagnostics on expanding plasma ionization dynamics of a new z-pinch plasma experiment built at the University of Michigan.

“Radiography Experiments and Theory”

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

Sponsor: Sandia National Laboratories
\$75,000; 2/15/2008 – 9/30/2010

“Collimated fast neutron beam generation using intense laser plasma interactions”

PI: Karl Krushelnick
Sponsor: Naval Research Laboratory, Defense Threat Reduction Agency
\$700,000; 2010

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

PI: Karl Krushelnick
Sponsor: National Science Foundation, DNDO
\$1,835,000; 5 years

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

PI: Karl Krushelnick
Sponsor: Department of Energy, NNSA
\$180,000; 2 years

“Investigation of Short Pulse Laser Pumped Gamma-ray Lasers”

PI: Karl Krushelnick
Sponsor: Lawrence Livermore National Laboratory
\$30,000; 2010

“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; 5 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; 3 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
Sponsor: Defense Threat Reduction Agency
\$1,760,000; 5 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 – 7/14/2012
Sponsor: National Science Foundation
\$15,000; 10/1/2009 – 9/30/2012

Studies the growth and stabilization of the Magneto Rayleigh Taylor instability of foil plasmas driven by 1-MA LTD recently built at the University of Michigan.

“Advanced RF sources based on nonlinear transmission lines”

PI: Y.Y. Lau, Co-PI: Ron Gilgenbach
Sponsor: AFOSR
\$300,000; 7/1/2009 – 6/30/2012

“Non-Linear Optics in Plasmas at Ultra-High Intensities”

PI: Alec Thomas
Sponsor: National Science Foundation
\$500,000; 1/1/2010 – 12/31/2012

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

\$407,279; 9/1/2010 – 2/28/2012

“Development of HgS and HgO semiconductor gamma-ray spectrometers”

PI: Zhong He

Sponsor: Domestic Nuclear Detection Office, Radiation Monitoring Devices

\$90,000; 9/22/2008 – 12/31/2010

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

PI: Zhong He

Sponsor: Domestic Nuclear Detection Office, Radiation Monitoring Devices

9/22/2008 – 12/31/2011

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.

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

“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.

“Characterization of the Capture-Gated liquid Scintillator BC-523A

PI: Sara Pozzi

Sponsor: Department of Energy, NA-24
\$68,000; year

This work is a continuing collaboration with the Institute for Reference Materials and Measurements (IRMM), the Institute for the Protection and Security of the Citizen (IPSC), and Oak Ridge National Laboratory (ORNL). The aim of the collaboration is to pool resources and competencies in the area of detector development and Monte Carlo simulations. In this part of the research project, the response of the capture-gated detector BC-523A to typical neutron sources was measured at ORNL. The results of these measurements are being used to develop new physics models to be included in the Monte Carlo simulations for this type of detector.

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

PI: Sara Pozzi, Co-PI: M. Flaska, S. 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

\$31,000; 9/2009 - 12/2011

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.”

“New University of Michigan Laboratory for Research and Teaching in Nuclear Nonproliferation”

PI: Sara Pozzi

Sponsor: Department of Energy, NEUP

\$160,000; 9/1/2010 – 8/31/2011

This project provides funding to acquire the equipment for a dual imager developed at UM for neutron and gamma ray imaging of nuclear materials at standoff distances.

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

PI: Sara Pozzi (UM)

Sponsor: Department of Energy, NNSA, NA-22

\$104,500; 11/2010 – 9/2011

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: M. Flaska, S. 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.

“A Multisensor Fusion Approach to the Solution of Inverse Radiation Transport Problems”

PI: Sara Pozzi (UM)

Sponsor: Department of Energy, National Nuclear Security Administration, NA-22

\$285,000; 3 years

The MCNP-PoliMi code system has been used in the past to accurately predict the results of neutron multiplicity measurements using an active well coincidence counter. The goal of this project is to validate MCNP-PoliMi for passive neutron multiplicity analysis. Measurements of a weapons-grade plutonium sphere with various thicknesses of polyethylene shielding were performed at the Nevada Test Site by Sandia National Laboratories personnel, and are used in this project for code validation. The metric chosen for comparing the simulation to the measured data is the Feynman-Y, which characterizes the deviation of the neutron multiplicity distribution from a multiplying medium from that of a Poisson distribution.

“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

“Monte Carlo Simulations for Tunable, Mono-energetic Gamma ray Source for Detection of Embedded SNM”

PI: Sara Pozzi

Sponsor: Department of Homeland Security, DNDO

\$266,500; 1/1/2008 – 10/31/2010

In this project we develop algorithms and Monte Carlo models to determine the detector response for various gamma ray detectors. The results of this modeling are compared to experiments performed at the University of Nebraska. The final goal of this project is to develop a source that could be used to detect and identify shielded special nuclear materials.

“Development of Semi-Autonomous Robots for Hazardous Environments”

PI: David Wehe

Sponsor: Department of Energy

\$4,369,500; 9/1/2004 – 8/31/2012

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 2011 Research Expenditures

(July 1, 2010 – June 30, 2011)

RESEARCH EXPENDITURES ATTRIBUTED TO AN EXTERNAL SPONSOR

Project Director	Sponsor	Project Title	Project Grant	Expenditures
Atzmon	National Science Foundation	Structure, Properties, and Relaxation of Shear Bands in Metallic Gases	F015539	\$74,162
Downar	Electric Power Research Institute	Technical Evaluation of the HITACHI Resource-Renewable BWR	N010448	\$132,747
Downar*	Department of Energy	Fellowships	F026647	\$152,657
Downar	Department of Energy - Subcontract	Multi-scale Multi-physics Methods Development for the Calculation	F023726	\$88,264
Downar	DOE - Subcontract	VHTR Advanced Modeling and Simulation	F024778	\$81,061
Downar	Nuclear Regulatory Commission	PARCS Development and Assessment for the Next Generation	F023763	\$244,351
Downar	NRC	PARCS Maintenance and Support for Light Water Reactors (LWRs)	F026439	\$220,048
Downar	Nuclear Regulatory Commission – Subcontract	Basic Research on High Temperature Gas Reactor Thermal	F021635	\$89,819
Foster	DOE – Subcontract	LCIF Measurements on Low Pressure Microwave Generated Disch	F025455	\$10,000
Foster*	NASA	Optimization of an ECR Plasma as a Source for Electric	F018178	\$4,919
Foster*	NASA	Non-Intrusive Measurement of Electric Field in Pulsed Nanosecond	F022929	\$25,187
Foster*	NASA	Water Purification by High Voltage, Nanosecond Plasma	F026216	\$1,724
Foster	NASA – Subcontract	50cm Ion Thruster for Near-	F024742	\$41,751

		Earth Applications		
Foster	National Science Foundation	An Investigation of Plasma Discharge in Harmonically	R000225	\$4,225
Foster	NSF	An Investigation of Plasma Formation in Electromechanically Driv	F025922	\$81,819
Foster	NRC	Sub of F024078-Faculty Development Program at UM	F024154	\$65,693
Gilgenbach	Department of Defense-Air Force	Innovative Inverted Magnetron Experiments and Theory	F024883	\$289,793
Gilgenbach	DOD-Air Force	Ultra-Short Pulse Laser for Advanced Cathodes and Windows	F026306	\$180,556
Gilgenbach	DOD-Air Force - Subcontract	Basic Studies of Distributed Discharge Limiters for Counter-HPM	F022658	\$263,723
Gilgenbach	DOD-Air Force – Subcontract	STTR Subcontract: Advanced Nonlinear Transmission Lines as...	F025225	(\$3,724)
Gilgenbach	Department of Defense-Navy – Subcontract	Phase Locking of COTS Magnetrons	F023774	\$104,545
Gilgenbach	DOE – Subcontract	Ionization Dynamics of Wire Z-Pinches	F019326	\$58
Gilgenbach*	DOE – Subcontract	Krell Institute Academic Allowance-Department of Nuclear Eng....	F027410	\$1,003
Gilgenbach	DOE – Subcontract	Recyclable Transmission Line Experiments on Line at Trans....	F027694	\$30,285
Gilgenbach	L-3 Communications	Support for University Research in Vacuum Electronics	N007747	\$4,838
Hammig	DOD-Defense Threat Reduction Agency	Silicon-Based Examination of Gamma-Ray and Newton...	F016785	\$171,547
Hammig	DOD-Other – Subcontract	SNM Detection at Long-Range via Low-Frequency Electro....	F024877	\$14,161
Hammig	Department of Homeland Security	Silicon-Based 3D Position-Sensitive Scatter Detector	F017068	\$204,008
Hammig	DHS	Sub of F017068-SubK-Galt LLC	F017411	\$58,390
Hartman*	Department of Commerce – National Institute of	Summer Support Through the SURF Program at the Institute	F027674	\$3,043

	Standards & Technology			
Hartman	DOE	Enhancing the Research and Teaching Capabilities of the Univ	F023512	\$172,410
Hartman	DOE	Fab of F023512-Enhancing the Research and Teaching Capabilities of....	F024369	(\$135,994)
Hartman	DOE	Fab of F023512-Enhancing the Research and Teaching Capabilities of....	F024370	(\$62,200)
Hartman	DOE	Fab of F023512-Detector Shielding Enclosure	F025307	(\$25,068)
Hartman	DOE	Fab of F023512-Time-of-Flight Detection Equipment	F025308	(\$11,130)
Hartman	DOE – Subcontract	Sub of F026317-Evaluation of Materials for Interim Storage of Spent	F027104	\$64,453
Hartman*	DHS	Sub of F026751-YR1-Nuclear Forensics Junior Faculty Award Program	F026368	\$110,385
Hartman	NRC	Sub of F020758-NERS-Faculty Development	F020990	\$6,760
He	DOD-DTRA – Subcontract	Target-Linked Radiation Imaging (TLRI)	F024644	\$258,636
He	DOD-Other – Subcontract	Detection of Shielded Uranium and Plutonium	F018191	\$621,154
He	DOD-Other – Subcontract	Fab of F015358-Detection of Shielded Uranium and Plutonium	F018191	\$53,686
He	DOD-Other – Subcontract	Sub of F015358-PO Sub-Detection of Shielded Uranium and Plutonium	F018477	\$427,025
He	DOE	Development of High Resolution 3-Dimensional Position-Sensitive....	F016320	\$262,850
He	DOE	Digital 3-Dimensional Position-Sensitive Semiconductor Radiation	F025135	\$135,590
He	DHS	Sub of F023748-YR3-Development of Integrated Real-Time Imaging and	F023729	\$36,605
He	DHS	Sub of F023748-YR3-Development of Integrated Real-Time Imaging and	F023863	\$19,226
He	DHS	Sub of F023748-YR4-Development of Integrated	F026458	\$189,751

		Real-Time Imaging		
He	DHS	Sub of F023748-YR4- Development of Integrated Real-Time Imaging	F026504	\$145,596
He	DHS – Subcontract	Development of HgS and HgO Semiconductor Gamma- Ray	F023213	\$5,009
He	DHS – Subcontract	Development of TlBr and InBr Semiconductor Gamma-Ray Spec	F023713	\$41,171
Holloway	DOD-DTRA	Genetic Algorithms to Identify Optimal Material Arrangement for....	F020456	\$92,071
Holloway	DOE	Sub of F019844-Center for Radiative Shock Hydrodynamics (CRASH)	F019849	\$483,702
Larsen	DOE – Subcontract	The Suppression of Energy Discretization Errors in Multigroup	F024273	\$101,973
Larsen	DOE – Subcontract	Hybrid Monte Carlo/Deterministic Radiation Transport Simulations	F024315	\$69,781
Larsen	DOE – Subcontract	An Asymptotic “2D- Transport, 1D-Diffusion” Approximation of the	F024414	\$66,757
Lau	DOD-Air Force	Advanced RF Sources Based on Novel Nonlinear Transmission	F023644	\$92,160
Lau	DOE	Theoretical and Experimental Studies of the Magneto- Rayleigh	F023838	\$126,739
Lau	NSF	Theoretical and Experimental Studies of the Magneto- Rayleigh	F023789	\$1,547
Lee	DOE – Subcontract	Bayesian Network for Reliability Analysis of Dynamical Systems	F025622	\$28,878
Lee	DOE – Subcontract	Bayesian Network for Reliability Analysis of Dynamical Systems-II	F027416	\$35,896
Lee	Michigan Public Service Commission	Sub of N010447-DTE Energy- MPSC PHEV Pilot Proposal	N010460	\$70,848
Martin*	DOE	Scholarships-Sub of F023439	F023564	\$45,000
Martin*	DOE	Fellowships-Sub of F023439	F023565	\$119,772
Martin	DOE – Subcontract	Creation of a Full-Core HTR Benchmark with the Fort S.	F023756	\$203,535

		Vrain		
Martin	DOE – Subcontract	Consortium for Advanced Simulation of Light Water Reactors (CASL)	F026076	\$897,959
Martin	DOE – Subcontract	Implementation of On-the-fly Doppler Broadening in MCNP5	F026319	\$103,147
Martin*	National Academy for Nuclear Training	Graduate Fellowships in Nuclear Engineering	N008693	\$27,945
Martin*	NRC	Department of Nuclear Engineering and Radiological Sciences	F020760	\$55,734
Martin*	NRC	Proposal to the Nuclear Regulatory Commission to Establish the...	F023382	\$45,885
Martin	NRC	Faculty Development Program at the University of Michigan	F024078	\$141
Martin*	NRC	Undergraduate Nuclear Engineering Scholarship Program at the U...	F025359	\$66,048
Pozzi	DOD-DTRA – Subcontract	PHASE I – iFIND Mobile Detection System	F023299	\$42,273
Pozzi	DOD-DTRA – Subcontract	YR1 CLIN0001-Compat Source of Laser-Driven Monoenergetic Gamma-Rays	F027417	\$35,731
Pozzi	DOE	Digital Waveform Sampling of Neutron and Gamma Ray Signals	F024818	\$104,813
Pozzi	DOE	FAB-New University of Michigan Laboratory for Research and Tea...	F026304	\$132,811
Pozzi	DOE – Subcontract	Characterization of the Capture-Gated Liquid Scintillator BC-523	F020796	(\$8,057)
Pozzi	DOE – Subcontract	A Multisensor Fusion Approach to the Solution of Inverse	F021885	\$100,481
Pozzi*	DOE – Subcontract	Development of a New Graduate Level Course in Nuclear...	F023805	(\$190)
Pozzi	DOE – Subcontract	Basic Physics Data: Improved Fission Neutron Data...	F023849	\$128,548
Pozzi	DOE – Subcontract	Sub of F023849-Basic Physics Data: Improved Fission Neutron Data...	F023979	\$154,072
Pozzi	DOE – Subcontract	Digital Fast Neutron	F027394	\$51,557

		Detection System for Simultaneous Time Cor....		
Pozzi	DOE – Subcontract	Neutron Interrogation for Fuel Cycle Measurements	F027470	\$21,500
Pozzi	DHS	Sub of F026265-YR2 New Detectors, Electronics, and Algorithms for...	F026423	\$104,631
Pozzi	DHS	Sub of F026265-YR2 New Detectors, Electronics, and Algorithms for...	F026440	\$91,192
Pozzi	DHS – Subcontract	Monte Carlo Simulations for Tunable, Mono-energetic Gamma-Ray...	F019736	\$15,239
Pozzi	NSF	New Detectors, Electronics, and Algorithms for Fast Neutron	F023551	\$2,400
Pozzi	NSF	Sub of F023551-New Detectors, Electronics, and Algorithms for Fast	F023639	\$15,627
Pozzi	NSF	Sub of F023551-New Detectors, Electronics, and Algorithms for Fast	F023737	\$69,043
Pozzi	NRC	Sub of F020758-Department of Nuclear Engineering and Radiological Sciences-Faculty Development	F020989	\$46,329
Thomas	NRC	Sub of F024078-Department of Nuclear Engineering and Radiological Sciences-Faculty Development	F024156	\$99,129
Wang	DOE	Self-Organized 3-D Array of Nanostructures Under Irradiation	F007316	\$140,986
Wang	DOE	Accelerator Based Study on Irradiation Creep in Pyrolytic Carbon...	F015452	(\$18)
Wang	DOE	Sub of F018506-Consortium on Cladding & Structural Materials for Adv	F019437	\$29,407
Wang	DOE	Sub of F022352-Lumin Wang-Particle Induced Amorphization of	F012220	(\$1,114)
Wang	DOE – Subcontract	A Nuclear Energy Research Initiative for Consortia (NERI-C) for...	F019745	\$28,048
Wang	DOE – Subcontract	Evaluation of Materials for Interim Storage of Spent Fuel	F026317	\$112,692

		for...		
Wang	NSF	Sub of F01121-Lumin Wang-Nanoparticle-Environment Interfaces	F012244	(\$347)
Was	Electric Power Research Institute	Potential for Atom Probe Tomography in Understanding IASCC	N009257	\$30,805
Was	EPRI	Cladding and Structural Materials for Advanced Reactor Systems	N009514	\$34,943
Was	EPRI	Identifying Mechanisms and Mitigation Strategies for Irradiation	N010827	\$264,016
Was	EPRI	Factor of Improvement in Resistance of Stress Corrosion Crack...	N012413	\$80,118
Was	EPRI	Establishing a Cause-and-Effect Relationship Between Localized	N012581	\$106,948
Was	DOE	Sub of F014552-Accelerator Based Study on Irradiation Creep in Pyrol	F015795	(\$214)
Was	DOE	Radiation-Induced Segregation and Phase Stability in Candidate...	F018205	\$113,237
Was	DOE	Consortium on Cladding and Structural Materials for Advanced...	F018506	\$69,691
Was	DOE	SubK of F018205-Radiation-Induced Segregation and Phase Stability in	F018521	\$69,196
Was	DOE	Sub of F018506-Alabama A&M Consortium of Cladding & Structural Materials...	F018702	\$55,429
Was	DOE	Sub of F018506-UC Santa Barbara-Consortium of Cladding & Structural Materials	F018703	\$116,383
Was	DOE	Sub of F018506-UW-Madison-Consortium of Cladding & Structural Materials	F018704	\$71,076
Was	DOE	Sub of F018506-UC Berkeley-Consortium of Cladding & Structural Materials	F018705	\$40,056
Was	DOE	Sub of F018506-Penn State-Consortium of Cladding &	F018706	\$98,739

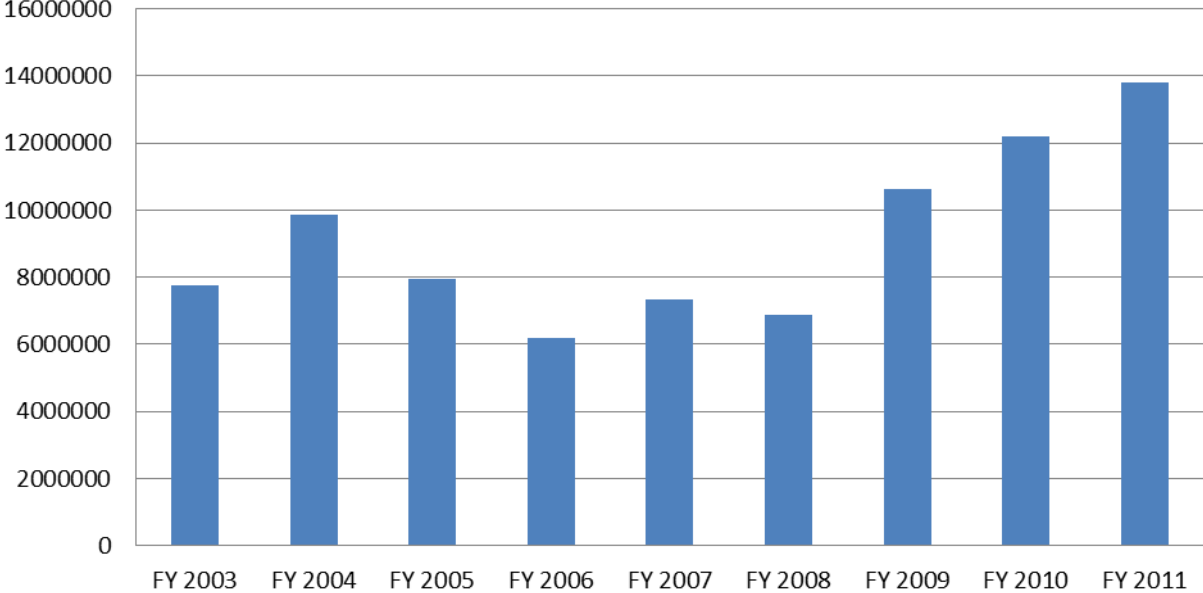
		Structural Materials		
Was	DOE	Localized Deformation and Intergranular Fracture of Irradiated...	F021533	\$108,100
Was	DOE	Sub of F021533-Localized Deformation and Intergranular Fracture of...	F021747	\$68,998
Was	DOE	Sub of F021533-Localized Deformation and Intergranular Fracture of...	F021748	\$74,100
Was	DOE – Subcontract	Sodium Compatibility of Advanced Fast Reactor Materials	F022060	\$54,171
Was	DOE – Subcontract	Identifying Mechanisms and Mitigation Strategies for Irradiation	F022700	\$181,944
Was	DOE – Subcontract	Corrosion and Creep of Candidate Alloys in High Temperature	F023807	\$102,982
Was	DOE – Subcontract	Intergranular Attack and Stress Corrosion Cracking in Nickel-Base	F024029	\$21,028
Was	DOE – Subcontract	Aging and Embrittlement of High Fluence Stainless Steel	F024274	\$96,070
Was	DOE – Subcontract	Sub of F024274-Aging and Embrittlement of High Fluence Stainless Steel	F024371	\$24,472
Was	DOE – Subcontract	Enhancing the Research and Teaching Capabilities of the University	F024650	\$120,000
Was	DOE – Subcontract	Microstructure and Property Evolution in Advanced Cladding and...	F026313	\$150,447
Was	DOE – Subcontract	Irradiation-Accelerated Corrosion of Reactor Core Materials 10-068	F026314	\$133,510
Was	DOE - Subcontract	Proton Irradiation Induced Creep in Pyrocarbon	F026315	\$67,260
Was	DOE – Subcontract	SubK University of Notre Dame	F026379	\$45,543
Was	DOE – Subcontract	SubK of F026313-University of Wisconsin	F026380	\$135,748
Was	DOE – Subcontract	Fab of F026314-Irradiation-Accelerated Corrosion of Reactor Core Matter	F026825	\$172,117
Was	DOE – Subcontract	Sub of F026766-Fission Product Transport in Triso	F026932	\$51,329

		Particle Layers		
Was	DOE – Subcontract	Sub of F026317-Fab-Evaluation of Materials for Interim Storage of Sp	F027105	\$4,146
Was*	DOE – Subcontract	Recharge for Michigan Ion Beam Laboratory-ATR	F026168	\$7,410
Was	Institute of Nuclear Safety System (INSS)	Ion Irradiation-Induced Degradation of Reactor Structural	N010334	\$106,083
Was*	Various Sponsors	Recharge for MIBL	N009040	\$56,787
Wehe*	Elsevier Science B.V.	Editorial Services for Journal “Nuclear Instruments...	N007321	\$12,178
Wehe	DOE	Mobile Robotics and Sensing-Univ Research Prog in Robotics	F010788	\$404,201
Wehe*	DHS	Support for Symposium on Radiation Measurements and...	F025074	\$34,903
Sub Total:				\$12,584,195

*Amounts in parentheses are accounting adjustments

Total Research Expenditures Attributed to an External Sponsor	\$12,584,195
Total Internal Research Expenditures	\$775,460
GSRA RIP3 Outstate Differential	\$446,109
Grand Total	\$13,805,764

Research Expenditures History



Publications

(January 1, 2010 – December 31, 2010)

FISSION SYSTEMS AND RADIATION TRANSPORT

Books and Chapters in Books

J. C. Lee and N. J. McCormick, *Risk and Safety Analysis of Nuclear Systems*, Wiley (May 2011).

E.W. Larsen and J.E. Morel, "Advances in Discrete-Ordinates Methodology," in *Nuclear Computational Science: A Century in Review*, edited by Y.Y. Azmy and E. Sartori, Springer, Heidelberg (May, 2010).

A.K. Prinja and E.W. Larsen, "General Principles of Neutron Transport," in Volume 1 of *Handbook of Nuclear Engineering*, edited by D.G. Cacuci, Springer (2010).

Journal Articles

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- B. Donmez, C. Thrall, Z. He, H. Kim, L. J. Cirignano, K. S. Shah, "Investigations of Polarization Effect with TlBr Detectors at Different Operating Temperatures," IEEE Nuclear Science Symposium and Room-Temperature Semiconductor X & Gamma-Ray Detectors Workshop, Knoxville, TN, Oct. 31 – Nov. 5, 2010.
- W. R. Kaye, F. Zhang, Z. He, "Calibration and Operation of the Polaris CdZnTe Array," IEEE Nuclear Science Symposium and Room-Temperature Semiconductor X & Gamma-Ray Detectors Workshop, Knoxville, TN, Oct. 31 – Nov. 5, 2010.
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A. Poitrasson-Riviere, B. Maestas, M. Hamel, S. Clarke, M. Flaska, S. A. Pozzi, A. Gueorguiev, G. Pausch, C-M. Herbach, M. Ohmes, J. Stein, "High-Fidelity Compton-Camera System for Nonproliferation Applications," Institute of Nuclear Materials Management 51st Annual Meeting, Baltimore, MD, July 11-15, 2010.

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S. D. Clarke, C. Lawrence, M. Flaska, S. A. Pozzi, D. D. Wentzloff, M. Faisal, R. Schiffer, B. Czirr, L. Rees, "Analysis of a Cadmium-Plastic Scintillator Capture-Gated Neutron Detector," Institute of Nuclear Materials Management 51st Annual Meeting, Baltimore, MD, July 11-15, 2010.

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Service

(January 1, 2010 – December 31, 2010)

SERVICE TO THE DEPARTMENT, COLLEGE, AND UNIVERSITY	
Chair, Reappointment Committee for Professor Michael Hartman	Atzmon
Member, NERS Curriculum Committee	Atzmon
Member, MSE Graduate Committee	Atzmon
Member, Interdisciplinary Engineering Degree Program Review Committee	Atzmon
Advisor, Engineering Physics	Atzmon
Coordinator, Materials Option for NERS	Atzmon
Representative, COE interview of MSE Faculty Candidate	Atzmon
Director, NERS Undergraduate Program	Bielajew
Coordinator, ABET for NERS	Bielajew
Founder, 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	Bielajew
Chair, NERS Graduate Committee	Downar
Chair, NERS Department Faculty Search Committee	Downar
Member, NERS Executive Committee	Foster
Member, Applied Physics Executive Committee	Foster
Member, Center for Research on Learning and Teaching Advisory Board	Foster
Member, Rackham "Bridges to the PhD" Committee	Foster
Member, Rackham AGEP	Foster
Panelist, Rackham "State of the Union: Minority Crisis in Graduate Education" Workshop	Foster
Advisor, Faculty-Student ANS	Foster
Advisor, Faculty-NSBE	Foster
Advisor, Faculty-NASA RASC-AL Undergraduate Design Team	Foster
Reviewer, Rackham Merit Fellowship	Foster
Member, COE Commission on Undergraduate Engineering Education	Hartman
Member, COE Safety Committee	Hartman
Member, NERS Chair Search Committee	Hartman
Advisor, Engineering Advising Center (EAC)	Hartman
Director, Neutron Science Laboratory	Hartman
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 Radiation Policy Committee, ad hoc Radon Subcommittee	Kearfott
Member, UM Goldwater Scholarship Committee	Kearfott
Member, UM Senate Assembly	Kearfott

Member, Senate Advisory Committee on University Affairs (SACUA)	Kearfott
Member, Government Relations Advisory Committee	Kearfott
Member, SACUA Liaison, Senate Assembly Committee for a Multicultural University	Kearfott
Member, SACUA Liaison, Academic Affairs Advisory Committee	Kearfott
Director, COE Undergraduate Admissions	Kearfott
Vice President, UM Chapter of the American Association of University Professors	Kearfott
Advisor, Faculty-COE SAGE (reorganized as oSTEM)	Kearfott
Advisor, Faculty-UM Health Physics Society Student Branch	Kearfott
Member, Center for Ultrafast Optical Science (CUOS) Executive Committee	Krushelnick
Member, NSF PFC-FOCUS Council Member	Krushelnick
Member, NERS Chair Search Committee	Krushelnick
Member, NERS Graduate Committee	Krushelnick
Member, COE Honors and Awards Committee	Krushelnick
Member, Rackham Outstanding GSI Awards Committee	Krushelnick
Associate Director, High Field Science at CUOS	Krushelnick
Thrust Leader, High Field Science in FOCUS Physics Frontier Center	Krushelnick
Chair, NERS Colloquium Committee	Larsen
Chair, NERS Curriculum Committee	Larsen
Member, COE Curriculum Committee	Larsen
Advisor, NERS Undergraduate	Larsen
Chair, NERS Plasma Option	Lau
Chair, Reappointment Committee for Professor Alec Thomas	Lau
Member, NERS Curriculum Committee	Lau
Member, NERS Colloquium Committee	Lau
Member, COE Scholastic Standing Committee	Lau
Chair, NERS Chair Search Committee	Lee
Chair, COE Faculty Nominating Committee	Lee
Member, COE Research Advisory Committee	Lee
Member, NERS NRC Fellowship Committee	Lee
Member, NERS Faculty Search Committee	Martin
Member, COE Budget Priority Committee	Martin
Member, COE Entrepreneurship Task Force	Pozzi
Member, Dean's Advisory Committee on Diversity	Pozzi
Member, NERS Chair Search Committee	Pozzi
Member, NERS Executive Committee	Pozzi
Member, NERS Evaluation of the Candidacy Exam Committee	Pozzi
Member, Rackham Faculty Allies for Diversity in Graduate Education	Pozzi
Advisor, Faculty-INMM Student Chapter at UM	Pozzi
Member, NERS Qualifying Exam Committee	Thomas
Member, Center for Ultrafast Optical Science Executive Committee	Thomas
Judge, MIPSE Annual Graduate Student Symposium	Thomas
Judge, University of Michigan College of Engineering Cyber Infrastructure Poster Session	Thomas
Marshall, Spring Commencement	Thomas
Member, NERS Graduate Committee	Wang
Member, Reappointment Committee for Professor Sara Pozzi	Wang
Member, Reappointment Committee for Professor Kai Sun (MSE)	Wang

Member, COE International Program Committee	Wang
Member, NERS Graduate Committee	Was

SERVICE TO THE NATION	
Reviewer, Proposals-National Science Foundation	Atzmon
Reviewer, Proposals-NSF CBET	Foster
Reviewer, Proposals-NSF Joint Research Grants	Foster
Reviewer, Proposals-US Civilian Research and Development Foundation	Foster
Reviewer, DOE Office of Science Graduate Fellowships	Foster
Member, National Council on Radiation Protection Scientific Committee	Kearfott
Reviewer, DOE Office of Nuclear Energy University Programs 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-Department of Energy	Lau
Reviewer, Proposals-AFOSR	Lau
Reviewer, Proposals-NEUP	Lee
Chair, Department of Energy INCITE Nuclear Physics Review Panel	Martin
Reviewer, Proposals-NEUP	Pozzi
Reviewer, Proposals-DOE Office of Nuclear Energy	Pozzi
Reviewer, Department of Energy, NNSA NA-22 Projects	Pozzi
Reviewer, Department of Energy Graduate Fellowship Onsite Panel	Thomas
Reviewer, Proposals-US Civilian Research & Development Foundation	Thomas
Reviewer, Proposals-NSF/DOE Partnerships in Plasma Science	Thomas
Reviewer, Proposals-DOE Nuclear Engineering University Program	Wang
Reviewer, Proposals-National Science Foundation	Wang
Reviewer, Proposals-DOE Basic Energy Sciences SCGF Program	Was
Reviewer, Proposals-DOE NA-22, DNDO, and DTRA Radiation Detection Projects	Wehe
Member, DOE Interagency Forensics Panel for Nonproliferation and Arms Control	Wehe

SERVICE TO THE PROFESSION	
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
Reviewer, Proposals-Israeli-Russian Federation Agreement on Scientific Cooperation	Atzmon
Member, National Academies Plasma Science Committee	Foster
Member, IEEE Plasma Science and Applications Technical Committee	Foster
Session Chair, Fusion Section of Student ANS Meeting	Foster
President, American Nuclear Society, Michigan Section	Hartman
Member, Spallation Neutron Source Scientific Review Committee	Hartman
Member, Oregon State TRIGA Reactor (OSTR) Operations Committee	Hartman
Member, Health Physics Society Academic Education Committee	Kearfott
Member, Health Physics Society Academic Education Committee, Subcommittee on Travel Grants	Kearfott

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
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, Technical Review Committee for the Mathematics & Computation Division of the American Nuclear Society	Larsen
Member, IEEE International Conference on Vacuum Electron Devices Program Committee	Lau
Member, International Advisory Committee, Department of Nuclear and Quantum Engineering, Korea Advanced Institute of Science and Technology	Lee
Member, International Advisory Board, International Summer School of Nuclear Power Plants, University of Tokyo	Lee
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, Rensselaer Polytechnic University External Advisory Board	Martin
Chair, Los Alamos National Laboratory, Computational Physics and Applied Mathematics Capability Review Committee	Martin
Chair, Honors and Awards Committee of the Radiation Instrumentation Steering Committee of the IEEE Nuclear and Plasma Sciences Society	Pozzi
Chair, INMM Communications Committee	Pozzi
Member, Institute of Nuclear Materials Management	Pozzi
Member, Radiation Instrumentation Steering Committee, IEEE Nuclear and Plasma Sciences Society (elected)	Pozzi
Member, Student Activities Committee, INMM	Pozzi
Member, INMM Central Chapter (elected)	Pozzi
Session Chair, 2010 IEEE Nuclear Science Symposium and Medical Imaging	Pozzi
Session Chair, INMM 51 st Annual Meeting, 2010	Pozzi
Member, High Energy Density Science Association Steering Committee (elected)	Thomas
Co-Chair, Working Group 1, Advanced Accelerator Concepts Workshop	Thomas
Judge and Chair, ANS Student Conference, LASERs and Nuclear Engineering Research Session	Thomas
Member, ANS International Program Committee	Wang
Member, IAEA Group on Very Long Term Storage of Used Nuclear Fuels	Wang
Chair, Materials Review Capability Team for Los Alamos National Laboratory	Was
Vice-Chair, International Cooperative Group on Environmentally Assisted Cracking	Was
Organizer, TMS Symposium on Microstructural Processes in Irradiated Materials	Was
Member, TMS Nuclear Materials Committee	Was
Member, TMS Corrosion and Environmental Effects Committee	Was
Member, MRS Special Programs Committee	Was
Member, International Conference on Environmental Degradation of Materials in Light	Was

Water Reactors Organizing Committee	
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 Organizing Committee	Was
Conference Chair, 2010 Symposium on Radiation Measurements and Applications	Wehe

EDITORIAL SERVICES	
Associate Editor, Physics of Plasmas	Gilgenbach
Associate Editor, Health Physics	Kearfott
International Advisory Board, Plasma Physics and Controlled Fusion	Krushelnick
Editorial Board, Transport Theory and Statistical Physics	Larsen
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, Applied Physics letters	Atzmon
Reviewer, Acta Materialia	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 Physics D	Atzmon
Reviewer, Mater. Science and Engineering A	Atzmon
Reviewer, Physical Review B	Atzmon
Reviewer, NSE/NucTech/ANE	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, Physics of Plasmas	Gilgenbach
Reviewer, IEEE Transactions on Plasma Science	Gilgenbach
Reviewer, Physical Review Letters	Hartman
Reviewer, Physical Review B	Hartman
Reviewer, Chemistry of Materials	Hartman
Reviewer, Nuclear Instruments and Methods In Physics Research Section A	Hartman
Reviewer, Nuclear Instruments and Methods in Physics Research	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, 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, Nuclear Instruments and Measurements, Section B (NIMB)	Larsen
Reviewer, Communications in Numerical Methods in Engineering	Larsen
Reviewer, Journal of Physics A	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
Reviewer, Nuclear Technology	Lee
Reviewer, Nuclear Engineering and Design	Lee
Reviewer, IEEE Transactions on Nuclear Science	Lee
Reviewer, Annals of Nuclear Energy	Lee
Reviewer, Journal of Computational 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, IEEE Transactions on Plasma Science	Thomas
Reviewer, Plasma Physics and Controlled Fusion	Thomas
Reviewer, Journal of Physics A	Thomas
Reviewer, Journal of Physics B	Thomas
Reviewer, Journal of Physics D	Thomas
Reviewer, New Journal of Physics	Thomas
Reviewer, Physics of Plasmas	Thomas
Reviewer, APL, JAP, NIMB, JNM	Wang
Reviewer, Metallurgical Transactions A	Was
Reviewer, Journal of Nuclear Materials	Was
Reviewer, Acta Metallurgica	Was
Reviewer, Nature Materials	Was
Reviewer, Corrosion	Was
Reviewer, IEEE Trans. Nucl. Sci.	Wehe

Personnel

(September 1, 2010 – August 31, 2011)

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

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

Ronald F. Fleming

Professor

PhD, Nuclear Engineering, University of Michigan, 1975

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

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

Michael Hartman

Assistant Professor

PhD, Nuclear Engineering, University of Michigan 2005

Application of neutron scattering techniques to study the underlying physical properties of matter; development of high-capacity, reversible, hydrogen storage materials

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

Assistant 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

Volkan Seker

Assistant Research Scientist

PhD (Nuclear Engineering), Purdue University, 2007

High temperature gas cooled reactor physics and thermo-fluids, computer code development in nuclear reactor analysis, parallel and high performance computing.

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

Lu-Min 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

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

Ruth F. Weiner

Adjunct Professor

PhD (Chemistry), Johns Hopkins University, 1962

Sandia National Laboratories
Radiation risk analysis, radioactive waste management

VISITING FACULTY

Senada Avdic

Visiting Associate Research Scientist

University of Tuzla, Department of Physics, Bosnia & Herzegovina
Invited by Professor Sara Pozzi

Han Gyu Joo

Visiting Professor

Seoul National University, Korea
Invited by Professor Thomas Downar

Guang Ran

Visiting Assistant Research Scientist

Xiamen University, China
Invited by Professor Lu-Min Wang

Yunlin Xu

Visiting Associate Research Scientist

Argonne National Laboratory
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

Shaily Bhola (Professor Gary Was)
Ben Collins (Professor Thomas Downar)
Andreas Enqvist (Professor Sara Pozzi)
Mathieu Hursin (Professor Thomas Downar)
Jae Cheon Kim (Professor Zhong He)
Jinan Yang (Professor William Martin)

STAFF

Technical Support

James Berry, Mechanical Engineer
Edward A. Birdsall, Facilities Infrastructure Manager
Rodney Capps, Web Applications Developer
Alex Flick, Research Project Engineer
Dan Jabaay, Engineer in Research Intermediate
Fabian Naab, Research Lab Specialist Associate
Mark Perreault, Senior Electronics Technician, Plasma Experimental Bay
Ovidiu Toader, Research Area Specialist Lead, Michigan Ion Beam Laboratory
Scott Wilderman, Research Computer Specialist

Administrative Support

Sheena Banghart, Secretary Intermediate
Donna Constant, Secretary Senior
Cherilyn Davis, Administrative Assistant Associate
Pam Derry, Academic Advisor/Counselor
Amber French, Accountant Associate
Peggy Jo Gramer, Senior Graduate Program Coordinator
Caroline Joaquin, Department Administrator
Pat Moore, Office and Editorial Assistant
Shannon Thomas, Research Process Coordinator
Lois Vazquez, Accounting Clerk Associate
Steven Winters, Administrative Assistant Senior

Advisory Board

(September 1, 2010 – August 31, 2011)

Wesley E. Bolch	Professor, Nuclear and Radiological Engineering University of Florida Gainesville, FL
Forrest Brown	Diagnostics Applications Group Los Alamos National Laboratory Los Alamos, NM
Frederick W. Buckman	President, Power Group The Shaw Power Group Portland, OR
Jack Davis	Senior Scientist Naval Research Laboratory Washington D.C.
Jonathan E. Grindlay	Professor, Department of Astronomy Harvard University Boston, MA
Simon E. Labov	Associate Program Leader Lawrence Livermore National Laboratory Livermore, CA
Richard C. Lanza	Senior Scientist, Dept. of Nucl. Sci. and Engineering Massachusetts Institute of Technology Cambridge, MA
Thomas A. Mehlhorn	Superintendent, Plasma Physics Division Naval Research Laboratory Washington D.C.
Arthur T. Motta	Chair and Professor, Nuclear Engineering Program Penn State University University Park, PA
G. Robert Odette	Professor, Mechanical Engineering & Materials University of California-Santa Barbara Santa Barbara, CA
Charles A. Schrock	President and CEO Integrays Energy Group Chicago, IL
Joseph Schumer	Head, Pulsed Power Physics Branch Naval Research Laboratory Washington D.C.
Jasmina Vujic	Professor, Department of Nuclear Engineering University of California-Berkeley Berkeley, CA
Steven J. Zinkle	Director, Materials Science and Technology Division Oak Ridge National Laboratory Oak Ridge, TN

