HEALTH PHYSICS EDUCATION REFERENCE BOOK

2010 - 2011

Health Physics Society
Academic Education Committee

Updated
June 2010

1. Bloomsburg University Pennsylvania BS
2. Clemson University South Carolina MS PhD
3. Colorado State University Colorado MS PhD
4. Duke University North Carolina MS PhD
5. Francis Marion University South Carolina BS
6. Idaho State University Idaho AA BS MS PhD
7. Illinois Institute of Technology Illinois MS
8. Linn State Technical College Missouri AA
9. Louisiana State University Louisiana MS PhD
10. Ohio State University Ohio MS PhD
11. Oregon State University Oregon BS MS PhD
12. Purdue University Indiana BS MS PhD
13. Rensselaer Polytechnic Institute New York BS MS PhD
14. San Diego State University California MS
15. Texas A&M University Texas BS MS PhD
16. Texas State Technical College Texas AA
17. Thomas Edison State College AS BS
18. University of Cincinnati Ohio MS PhD
19. University of Florida Florida BS MS PhD
20. University of Massachusetts Lowell Massachusetts BS MS PhD
21. University of Michigan Michigan BS MS PhD
22. University of Missouri-Columbia Missouri MS PhD
23. University of Nevada Las Vegas Nevada BS MS
24. University of Tennessee Tennessee BS MS PhD
25. Vanderbilt University Tennessee MS PhD
26. Virginia Commonwealth University

Degree Programs Recognized by the Accreditation Board for Engineering and Technology (ABET) in Health Physics under ABET's Applied Science Accreditation Commission (ASAC)

Bloomsburg University Health Physics (BS) (2006)
Clemson University Environmental Health Physics (MS) (2005)
Colorado State University Health Physics (MS) (2007)
Idaho State University Health Physics (BS) (2003)
Idaho State University Health Physics (MS) (2003)
Oregon State University Radiation (2004)
University of Nevada Las Vegas Health Physics (MS) (2003)

Degree Programs Recognized by the Accreditation Board for Engineering and Technology (ABET) in Radiological Engineering under ABET's Engineering Accreditation Commission (EAC)

Texas A&M University Radiological Health Engineering (BS) (1987)

1. BLOOMSBURG UNIVERSITY

Department of Physics Telephone: (570) 389-4109 /
Fax: (570) 389-3028

Program Director:
Dr. David R. Simpson Bloomsburg University
Department of Physics and Engineering Technology
Bloomsburg, Pennsylvania 17815

(570) 389-5142

HP Degrees Granted:
BS in Health Physics

Remote Delivery of Course: None

Health Physics Faculty (≥25% FTE toward the HP program)

Nazafarin Fallahian, Assistant Professor of Physics (717-389-4149); Ph.D. Idaho State 2008; Nuclear instrumentation, environmental radiation measurements, applied health physics. [nfallahi@bloomu.edu]

David R. Simpson, Associate Professor of Physics and Health Physics Program Director (570-389-5142). CHP, PhD University of Illinois 1981. Environmental radiation measurements, health physics medical applications, emergency response. [dsimpson@bloomu.edu]

Other Faculty Contributing to the Health Physics Program
Nathaniel Greene, PhD, Associate Professor of Physics

Other Information
The B.S. degree in health physics has a strong laboratory and instrumentation orientation. An off-campus internship in health physics is required. The Department of Physics and Engineering Technology in which the B.S. health physics degree is offered has a total faculty of eleven individuals.

Research Facilities
Two labs are dedicated to teaching and research in Health Physics. These labs are equipped with bench top space including sinks and drains, and floor and wall mounted storage space. One lab is equipped with two side-by-side HEPA filtered hoods for sample preparation. This lab also has a separate locked storage and preparation room, with its own HEPA filtered hood. Equipment within these labs include two high purity germanium detectors and computer analysis systems, eight NaI gamma Spectroscopy systems, a Si(Li) x ray detector system, six solid state PIPS systems for alpha and beta particle energy analysis, a TLD system, a liquid scintillation counter, a gas flow proportional counter, fourteen table top GM counting systems, and a range of portable detectors including pancake and side window portable GM counters, ionization chambers and a μR meter.

Sponsored Research Activities in Health Physics (2003 - Present)
Neutron activation analysis project in association with the Penn State Nuclear Reactor (funded for 2005-2006)
NRC Scholarship grant, 2007, 2008, 2009.

2. CLEMSON UNIVERSITY

Environmental Engineering and Earth Sciences Department
http://www.clemson.edu/ces/departments/eees/
Telephone: (864) 656-3276 / Fax: (864) 656-0672

Program Director:
Dr. Timothy A. DeVol
L.G. Rich Environmental Research Laboratory
Clemson University, 342 Computer Ct.
Clemson, South Carolina 29625-6510
864-656-1014
devol@clemson.edu

HP Degrees Granted:

M.S. in Environmental Engineering and Science (Environmental Health Physics ABET ASAC accredited)
Ph.D. in Environmental Engineering and Science

Enrollment and Graduates by Degree Type:

BS HP Enrollment (Spring 2010):	NA	BS HP Graduates (2009-10 academic year):	NA
MS HP Enrollment (Spring 2010):	7	MS HP Graduates (2009-10 academic year):	0
PhD HP Enrollment (Spring 2010):	5	PhD HP Graduates (2009-10 academic year):	1

BS HP Graduates (2008-09 academic year): NA
MS HP Graduates (2008-09 academic year): 0
PhD HP Graduates (2008-09 academic year): 1

Remote Delivery of Course: None

Health Physics Faculty (>25% FTE toward the HP program)

Timothy A. DeVol, Professor of Environmental Engineering and Earth Sciences (864-656-1014); Ph.D. University of Michigan 1993; Radiation detection instrumentation, environmental measurements, environmental applications of nuclear techniques, radioactive waste management. [devol@clemson.edu]

Brian A. Powell, Assistant Professor of Environmental Engineering and Earth Sciences; Ph.D. Clemson University 2004; Environmental radiochemistry, radiochemical separations of actinides, radioactive waste management, environmental restoration. [bpowell@clemson.edu]

Other Faculty

Birsen Ayaz-Maierhafer, Adjunct Assistant Professor
Michael G. Bronikowski, Adjunct Associate Professor, Savannah River National Laboratory
Elizabeth Carraway, Associate Professor of Environmental Engineering and Earth Sciences
David DiPrete, Adjunct Associate Professor, Savannah River National Laboratory
John C. Coates, Associate Researcher/Associate Professor of Environmental Engineering and Earth Sciences
Alan W. Elzerman, Professor of Environmental Engineering and Earth Sciences
Eduardo B. Farfan, Adjunct Assistant Professor, Savannah River National Laboratory
Robert A. Fjeld, Professor of Environmental Engineering and Earth Sciences, Emeritus
David L. Freedman, Professor of Environmental Engineering and Earth Sciences
Glenn Fugate, Adjunct Assistant Professor, Savannah River National Laboratory
C. P. Leslie Grady, Jr., Professor of Environmental Engineering and Earth Sciences, Emeritus
Annette Guiseppi-Elie, Adjunct Associate Professor, Dupont Corporation
Steven Hoeffner, Adjunct Associate Professor, Clemson Engineering Technology Laboratory
Tanju Karanfil, Professor and Chair of Environmental Engineering and Earth Sciences
Daniel Kaplan, Adjunct Associate Professor, Savannah River National Laboratory
Cindy M. Lee, Professor of Environmental Engineering and Earth Sciences
Thomas J. Overcamp, Professor of Environmental Engineering and Earth Sciences
Fred J. Molz, III, Professor of Environmental Engineering and Earth Sciences, Emeritus

Other Faculty (cont.)

James D. Narvatil, Professor of Environmental Engineering and Earth Sciences, Emeritus
Frank L. Parker, Eminent Scientist, Vanderbilt University
Mark A. Schlautman, Associate Professor of Environmental Engineering and Earth Sciences
Steven M. Serkiz, Adjunct Associate Professor, Savannah River National Laboratory

Research Facilities

The Department of Environmental Engineering and Science is the sole occupant of a 40,000 square foot office and laboratory facility located in a research park 8 miles from the main campus. The laboratory building contains a counting laboratory, a radiation detection research laboratory, a radiochemistry laboratory, and a radiation measurements teaching laboratory. Radiation detection instrumentation include eight high-purity germanium gamma-ray spectrometry systems (including one portable), several low-resolution (NaI:Tl) gamma-ray spectrometers, forty alpha spectroscopy systems, four alpha/beta discriminating liquid scintillation counters (including a Perkin-Elmer Quantulus), one CdZnTe x-ray spectrometer, a thermoluminescent dosimetry system, several neutron detectors, electret ion chambers, continuous radon monitors, and portable health physics instrumentation. Adjacent to the laboratory is the WMX Laboratory consisting of two state-of-the-art analytical laboratories, two high bay laboratories for scale-up projects, and a demonstration area. The WMX laboratory building houses our environmental radiochemistry laboratories and the radiation detection and measurements teaching laboratory. These facilities are specially designed for research and treatment technologies related to hazardous, radioactive, and mixed wastes.

Current Sponsored Research Activities in Health Physics

Radionuclide Sensors for Water Monitoring

Principal Investigator**:** Jay W. Grate (PNNL),
Co-Investigators: Timothy A. DeVol
Agency: US Department of Energy - EMSP
Type: Research Grant
Period: 2007-2010
The goals of this project are to investigate and develop rapid and automated radiochemical separation techniques and instrumentation for the quantification of alpha- and beta-emitting radionuclides in surface and groundwater.

Processes Controlling Enhanced Transport of Plutonium in Unsaturated Conditions

Principal Investigator: Daniel I. Kaplan
Co-Investigator: Fred Molz, (Clemson), Ravi Kukkadapu (PNNL), Heino Nitsche (LBNL), Christopher Bagwell (SRNL), Brian Powell (Clemson)
Agency: Department of Energy, Biological and Environmental Remediation, Subsurface Biogeochemical Research Program
Type: Research Grant
Period: 2007-2010

Environmental Transport of Plutonium: Geochemical Processes at the Femtomolar Concentration and Nanometer Scale

Principal Investigator: Brian A. Powell
Co-Investigator:
Agency: Department of Energy, Biological and Environmental Remediation, Subsurface Biogeochemical Research Program
Type: Research Grant
Period: 2009-2014

In collaboration with scientists from Lawrence Livermore National Laboratory through the DOE Office of Science, Biological and Environmental Research Scientific Focus Area on Transuranic Subsurface Transport. The project will examine and quantify possible mechanisms by which the environmental transport of plutonium occurs at a rate and to an extent which is not consistent with current conceptual models.

Development of a Self-Consistent Model of Plutonium Sorption: Quantification of Sorption Enthalpy and Ligand-Promoted Dissolution

Principal Investigator: Brian Powell
Co-Investigator: University of Michigan and Savannah River National Laboratory
Agency: Department of Energy, Biological and Environmental Remediation, Subsurface Biogeochemical Research Program
Type: Research Grant
Period: 2010-2013

The goal of this research is to improve our ability to predict the environmental behavior of plutonium through the development of a mechanistic model of plutonium speciation in subsurface environments. The speciation model will be a thermodynamic surface complexation model of plutonium sorption to mineral surfaces that is self-consistent with macroscopic batch sorption data, X-ray absorption spectroscopy (XAS) measurements, electron microscopy analyses, and quantum-mechanical calculations.

Development of Coupled On-line and Hands-on Radiation Detection and Radiochemistry Laboratory Courses

Principal Investigator: Brian Powell
Co-Investigator: Timothy DeVol
Agency: Nuclear Regulatory Commission
Type: Educational Grant
Period: 2009-2011

This project is to develop two nuclear laboratory courses into courses than can be conveniently offered to remote students. One of the laboratory courses is the standard radiation detection and measurements course while the other course is an advanced environmental radiochemistry laboratory

Iodine, Radium, and Strontium Geochemistry in Wetland and Subsurface Sediments

Principal Investigator: Brian Powell

Co-Investigator: NA

Agency: Savannah River Nuclear Services through South Carolina Universities Research and Education Foundation

Type: Research Grant
Period: 2010-2011

The goal of this project is to measure important geochemical parameters relevant to calculating the risk associated with disposing of iodine, strontium, and radium on the Savannah River Site (SRS).

U.S. Nuclear Regulatory Commission Education Fellowship Program

Principal Investigator: Timothy DeVol
Co-Investigator: Robert A. Fjeld
Agency: Nuclear Regulatory Commission
Type: Fellowship
Period: 2008-2012
This grant funds exceptional graduate student interested in nuclear science and engineering through their MS or Ph.D. degree.

Junior Nuclear Environmental Engineering and Science Faculty at Clemson University

Principal Investigator: Timothy DeVol
Co-Investigator: Tanju Karanfil
Agency: Nuclear Regulatory Commission
Type: Educational Grant
Period: 2010-2013
This grant funds two junior faculty in the nuclear environmental engineering and earth sciences program at Clemson University.

Other Information

Environmental Engineering and Earth Sciences is a graduate-only department where students specialize in one of six focus areas. The Nuclear Environmental Engineering and Earth Sciences (environmental health physics (ABET ASAC accredited and environmental radiochemistry) focus area is concerned with environmental and waste management aspects of nuclear technologies and the nuclear fuel cycle. These aspects include environmental health physics; radioactivity measurement; environmental radiochemistry; hazardous, radioactive, and mixed waste treatment and disposal; risk assessment; and transport of radioactive contaminants in the environment. Our collaborations with several of the national laboratories makes possible summer internship positions for interested students. Financial assistance is available through a variety of sources to include, but not limited to: research assistantships, teaching assistantships, NRC fellowships. Please visit our web site for more information on our department. Graduate school applications may be found at http://www.grad.clemson.edu/Admission.php

3. COLORADO STATE UNIVERSITY

Department of Environmental and Radiological Health Sciences
Telephone: (970) 491-5222 / Fax: (970) 491-0623
http://www.cvmbs.colostate.edu/erhs/healthphysics.htm

Program Director:

Dr. Thomas B. Borak Department of Environmental and Radiological Health Sciences

1618 Campus Delivery
Colorado State University
Ft. Collins, Colorado 80523-1673
(970) 491-0563
email: tborak@colostate.edu

HP Degrees Granted:
M.S. in Health Physics
Ph.D. in Health Physics
Ph.D. in Radioecology

Remote Delivery of Courses: Selected graduate courses are delivered online.

	MS	PhD
HP Enrollment (Fall 2010)	12	2
HP Graduates (9/09 to 8/10)	5	1
HP Graduates (9/08 to 8/09)	6	0

Health Physics Faculty (≥25% FTE toward the HP program)

Alexander Brandl, Assistant Professor (970-491-5222); Ph.D., University of New Mexico 2002; Radiation detection and dosimetry. [Alexander.Brandl@colostate.edu]

Thomas B. Borak, CHP, Professor (970-491-6450); Ph.D. Vanderbilt University 1969; Radiation physics and dosimetry. [thomas.borak@colostate.edu]

J. Fred Harmon, ABR (D,T). Assistant Professor (970) 297-4063; Ph.D., Medical Physics, University of Florida 1994; Medical imaging modalities. Optimization of therapeutic radiation oncology treatment methods. [Joseph.Harmon@colostate.edu]

Thomas E. Johnson, CHP, Assistant Professor (970-491-0563); Ph.D. Purdue University, 1997; Lasers, acute effects of ionizing radiation. [tj@lamar.colostate.edu]

John D. Zimbrick, Professor, (970-491-0219); Ph.D., University of Kansas, 1967, Radiation biophysics, dosimetry, radiation biochemistry. [zimbrick@colostate.edu]

Other Faculty

Joel S. Bedford, Professor of Radiation Biology, (970-491-7492), PhD, Oxford University, Chromosomal aberrations, radiation induced cancer. [Joel.Bedford@colostate.edu]

Shawki A. Ibrahim, Professor (970-491-1593); Ph.D. New York University 1980; Radiochemistry.

[sibrahim@colostate.edu]

John E. Pinder III, Associate Professor (970-491-5343); PhD. University of Georgia, 1977; Transport and fate of radioisotopes in the environment, remote sensing; GIS. [jepinder@uga.edu]

F. Ward Whicker, Professor (970-491-5343); Ph.D. Colorado State University 1965; Radioecology. [Ward.Whicker@colostate.edu]

Visiting Faculty Financial Assistance

There are no standing financial assistance programs for visiting faculty. Occasionally there is support through existing research grants or international agencies such as IAEA, NATO, etc.

Student Financial Assistance

Graduate research assistantships are available through funded research programs in the Department. Availability will vary depending on funding and enrollment. Currently there are research programs funded by DOE, NIH, NASA, ACS and other organizations. The Department has a training grant sponsored by NIOSH that provides financial support for students in Health Physics and Industrial hygiene. The Department also has an NRC training grant that supports students in Health Physics.

Research Facilities

Low level counting laboratory, instrumentation and dosimetry laboratory, whole body counter, radioanalytical chemistry laboratory, 6-MV electron accelerator, ^{60}Co and ^{137}Cs irradiators. The faculty have collaborative arrangements with Los Alamos National Laboratory, Lawrence Berkeley National Laboratory, the Savannah River Ecology Laboratory, Brookhaven National Laboratory and The National Institute of Radiological Sciences in Chiba, Japan. Faculty also have strong relationships with the USGS TRIGA reactor, as well as uranium mining and milling sites throughout the west. Students are assisted in obtaining summer internships with many federal and commercial facilities, including uranium mining and power reactor sites. Rocky Mountain National Park can be seen from our building, and we are within driving distance to some of the best skiing in the US.

Sponsored Research Activities in Health Physics (2003 – Present)

Modeling Nuclear Disaster Risk: The Interaction of Perceived Risk and Physical Radiation Exposure on Post-Chernobyl Psychosocial and Behavior Outcomes in Ukrainian Residents.

Principal Investigator: Thomas Borak **Agency:** NSF **Type:** Grant **Period:** 2008-2011 The objective of this research project is to develop models of human nuclear disaster risk that will more scientifically describe the complex psychosocial and health behavior consequences of radiological and other toxic disasters.

Dose-Rate Effects and Components of Systems Governing Variations in Susceptibility for Carcinogenic and Acute Radiation Risks following Gamma-Ray, Proton, or HZE Irradiation

Principal Investigator: Joel Bedford **Agency:** NASA **Type:** Grant **Period:** 2007-2010 This project compares dose rate effects of protons and gamma-rays for the induction of chromosomal aberrations and the formation and resolution of repair foci.

NASA NSBRI

Principal Investigator: Thomas Borak **Agency:** NASA **Type:** Grant **Period:** 2007-2010 The objective is to design, build and test a dosimetry system for monitoring the radiation exposure to space crews during Lunar EVA.

Radiofrequency Field Strength Fluctuation due to Digital Conversion of Television Signals

Principal Investigator: Thomas E. Johnson **Agency:** City of Golden **Type:** Research Grant **Period:** 2009 - 2014 The goal of this grant is to ascertain if the conversion to digital television signals will have an impact on Lookout Mountain residents

Infrared Lasers

Principal Investigator: Thomas E. Johnson **Co-Investigators:** Thomas E. Eurell **Agency:** DoD **Type:** Research Grant **Period:** 2007 - 2008 The goal of this award is to determine the safety of IR lasers.

Efficacy of Decontamination Products

Principal Investigator: Thomas E. Johnson **Co-investigators:** Thomas E. Eurell **Agency:** Cellular Bioengineering, Inc. **Type:** Research Grant **Period:** 2007 - 2008 The goal of this award is to determine the efficacy of various strippable compounds in removing loose surface radioactive material contamination.

Transgenerational Effects of Chronic Low-Dose Irradiation in a Medaka Fish Model System

Principal Investigator: John D. Zimbrick **Co-Investigator:** Thomas Hinton, Savannah River Ecology Laboratory **Agency:** Department of Energy, Low-Dose Radiation Program **Type:** Grant **Period:** 2005-2008 The overall goal of this project is to seek mechanistic information on transgenerational changes in gene activity and in mutation rates of microsatellite DNA, and the consequences of these changes induced by chronic irradiation in a promising model organism, i.e., Medaka fish and their progeny. Medaka specimens will be irradiated at selected dose-rates and total doses in the DOE-funded Low-Dose Radiation Facility at the Savannah River Ecology Laboratory (SREL). Studies on markers for mutations in microsatellite DNA from irradiated Medaka will be conducted at SREL. Measurements of mutation frequencies in this microsatellite DNA at SREL will be done in parallel with the CSU studies on gene activity to search for correlations in the changes being observed.

An Independent and Comprehensive Risk Assessment for Public Health and the Environment for Los Alamos National Laboratory

Principal Investigator: F. Ward Whicker **Agency:** University of California Type: **Contract Period:** 2003 – 2008

The goal of this project is to assess the offsite human health and ecological impacts of radionuclides and chemicals resulting from historic and present operations of Los Alamos national Laboratory. Technical areas addressed by this effort include radiation protection, risk assessment, and management decision support development.

Triage and Treatment of Laser Eye Injuries on the Modern Battlefield

Principal Investigator: Thomas E. Johnson **Co-Investigators:** Thomas E. Eurell **Agency:** Congressionally Directed Peer Reviewed Medical Research Program **Type:** Research Grant **Period:** 2003 - 2007

The goal of this research grant is to develop models for photon absorption in the cornea from infrared lasers and treatment for those injuries.

Radium-226 Levels in the Human Thyroid

Principal Investigator: Shawki A. Ibrahim **Agency:** National Cancer Institute**Type:** Pilot Grant **Period:** 2004 – 2006 The goal of this project is to determine ^{226}Ra levels in thyroids from the general population and from individuals with occupational exposure.

Exposure Assessment and Biokinetics of Depleted Uranium

Principal Investigators: John E. Pinder III and Shawki A. Ibrahim Agency: Los Alamos National Laboratory Type: Grant Period: 2003-2005
The objectives of this research were to investigate the binding of uranium to Los Alamos soils and its subsequent desorption into simulated lung fluid.

Radiation Biochemistry of Clustered Damage Sites in DNA
Principal Investigator: John D. Zimbrick Agency: NIH/NCI Type: Grant Period: 1999 – 2005

This study seeks to understand the relationships between clustered radicals produced in DNA from various types of radiations, and the structures of the final damaged bases. The spatial properties of the radicals and the variations of these properties as a function of energy deposited per unit track length is also being studied. The project relates to mechanisms of carcinogenesis, to the efficiency of repair of radiation damage, and to the development of more efficacious radiation sensitizers and protectors.

4. DUKE UNIVERSITY

Health Physics Track - Medical Physics Graduate Program
Telephone: (919) 684-1400 / Fax: (919)584-1490

CONTACT INFORMATION

DUKE UNIVERSITY
Health Physics Track – Medical Physics Graduate Program
Tele (919) 668-3188
Fax (919) 668-2783
http://www.safety.duke.edu/RadSafety/dukehp/
http://www.safety.duke.edu/RadSafety/drdl/default.asp
http://www.medicalphysics.duke.edu/
http://www.radccore.org/modules/rad_home_page/index.php?id=1
http://dailabs.duhs.duke.edu/about.html
http://www.tunl.duke.edu/
http://www.fel.duke.edu/
http://radonc.duke.edu/modules/div_medphys/index.php?id=6

PROGRAM DIRECTOR:

Dr. Terry Yoshizumi
Duke University, DUMC Box 3155
Durham, NC 27710
Email: yoshi003@mc.duke.edu

TYPES OF HP DEGREES GRANTED:

MS in Medical Physics (HP Track)
PhD in Medical Physics (HP Track)

ENROLLMENT AND GRADUATES BY DEGREE TYPE

BS HP Enrollment (Spring 2010): Not Applicable
MS HP Enrollment (Spring 2010): 3
PhD HP Enrollment (Spring 2010): 0

BS HP Graduates (2009-10 academic year): Not Applicable
MS HP Graduates (2009-10 academic year): 0
PhD HP Graduates (2009-10 academic year): 2

BS HP Graduates (2008-09 academic year): Not Applicable
MS HP Graduates (2008-09 academic year): 2
PhD HP Graduates (2008-09 academic year): 0

REMOTE DELIVERY OF COURSE:

No

HEALTH PHYSICS FACULTY (≥25% FTE toward the HP program) (List names, contact information, and research interests)

Terry Yoshizumi, PhD, DABR, DABMP, DABSNM, Professor of Radiology and Radiation Oncology (919-668-3188); PhD University of Cincinnati 1980; medical radiation dosimetry in CT, interventional radiology and cardiac catheterization/EP laboratories, small animal dosimetry, nanoparticle based radiation detector development. [yoshi003@mc.duke.edu]

Robert Reiman, MD, DABNM. Assistant Professor of Radiology (919-668-3186); MD Case Western Reserve University 1987. Anatomy and physiology for medical physicists, radiation protection in medical environment, internal radiation dosimetry, risk assessment and communication. [robert.reiman@duke.edu]

Rathnayaka Gunasingha, PhD. Faculty in Medical Physics (919-668-3189); PhD LSU 1995. Monte Carlo computational dosimetry and shielding. [rathnayaka.gunasingha@duke.edu]

Ehsan Samei, PhD, DABR. Professor of Radiology, Physics and Biomedical Engineering; PhD University of Michigan 1997. Medical imaging physics and radiation dosimetry. [samei@duke.edu]

James Colsher, PhD. Assistant Professor of Radiology; PhD University of Pennsylvania; Nuclear medicine physics and radiation dosimetry.

Haijun Song, PhD, DABR. Assistant Professor of Radiation Oncology (919) 681-3861; PhD MIT 1998. Radiation oncology physics. [haijun.song@duke.edu]

Ying Wu, PhD. Associate Professor of Physics (919) 660-2654; PhD Duke 1995. Nuclear physics and radiation detectors [ying.wu@duke.edu]

Other Faculty Contributing to the Health Physics Program
Lynne Hurwitz, MD, Associate Professor of Radiology
Donald Frush, MD, Professor of Radiology
Calvin Howell, PhD, Professor of Physics
FF Yin, PhD, Professor of Radiation Oncology

Research Facilities

Duke Radiation Dosimetry Laboratory	(Terry Yoshizumi, Director)
Duke Radiation Safety Physics Laboratory	(Terry Yoshizumi, Director)
Duke Radiation Calibration Laboratory	(Terry Yoshizumi, Director)
Duke Triangle Universities Nuclear Laboratory	(Calvin Howell, Director)
Duke Free Electron Laser Laboratory	(Calvin Howell, Director)
Duke Small Animal Irradiator Facility	(Mark Dewhirst, Director)
Duke Radiation Oncology Physics Laboratory	(Fang-Fang Yin, Director)
Duke PET Facility	(R E Coleman, Director)
Duke Radiation Oncology Linear Accelerators	(Chris Willet, Director)
Carl E Ravin Advanced Imaging Laboratory	(Ehsan Samei, Director)
Duke CT Institute	(Don Frush, Director)

OTHER INFORMATION:

Summer undergraduate internship
Opportunities exist for undergraduate students to experience operational health physics at Duke University

Graduate fellowship program
Graduate fellowships are available for qualified students admitted to Duke Medical Physics Graduate Program.

HP residency program
Health physics residency program may be available for recent MS and PhD graduates in health physics and related areas. Residents will spend both at Duke University Medical Center and Johns Hopkins Medical Center as part of the training in medical health physics. Contact the Director of HP.

Sponsored Research Activities in Health Physics

CURRENT GRANT SUPPORT:

Radiation dose assessment of Philips MD-Eleva
PI: Terry Yoshizumi
Agency: Philips Medical System
Type: Contract
Period: 11/24/2009 - 05/31/2010

Radiation dose assessment for X-Care and Hi-pitch scan modes on Definition Dual Source
PI: Lynne Hurwitz
Co-PI: Don Frush, David Enterline, Terry Yoshizumi
Agency: Siemens Medical System
Type: Research
Period: 2/1/10-6/1/10

Assessing Cumulative Effective Dose From Repetitive Liver Ct In Adult Patients With Chronic Liver Disease
PI: Lisa Ho (7%)
Co-PI: Terry Yoshizumi
Agency: U.S. Center of Disease Control
Type: Research
Period: 2/15/2010 – 2/14/2011

Duke University Health Physics Graduate Fellowship Program
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Graduate Fellowship Grant
Period: 9/1/2009-8/31/2010

Development of Nuclear Safety Graduate Level Courses Including Radionuclide Therapy Training Modules and Radiation Protection Laboratory Exercises (Year 3)
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Nuclear Education Grant
Period: 9/1/2009-8/31/2010

Center for Medical Countermeasures Against Radiation

Principal Investigator for Center Grant: Nelson Chao (Duke)
Principal Investigator for *Dosimetry Core*: Terry Yoshizumi
of Allergy and Infectious Diseases (NIAID), NIH
Type: Center Grant (5U19 AI067798-03)
Period: 8/31/2005- 7/31/2010

Photo-X Project
Principal Investigator: Tuan Vo-Dinh
Co-PI (Dosimetry Core): Terry Yoshizumi
Agency: Immunolight, LLC
Type: Research Grant
period: 1/21/2008-1/20/2011

Development of Nuclear Safety Graduate Level Courses Including Radionuclide Therapy Training Modules and Radiation Protection Laboratory Exercises
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Nuclear Education Grant
Period: 7/1/2007-6/30/2009

Pending grant support:
Novel, Nanoscale Compositions of Matter for Accurate, Ultra-Sensitive Detection of Diverse Sources of Ionizing Radiation
PI: Michael Therien, PhD
Co-PI: Terry Yoshizumi, Ying Wu
Agency: DEFENSE THREAT REDUCTION AGENCY
Type: Research Grant
Period: 12/1/2010- 11/30/2015

Enhancement of Graduate Medical Health Physics through Course Content Upgrades
PI: Robert Reiman, MD
Co-PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Nuclear Education Grant
Period: 9/1/2010-8/31/2011

Development Health Physics Faculty Development Program At Duke University
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Nuclear Education Grant
Period: 9/1/2010-8/31/2011

Development of Medical Health Physics Residency Program
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Nuclear Education Grant
Period: 9/1/2010-8/31/2011

Center for Medical Countermeasures Against Radiation

PI: Nelson Chao
PI (Dosimetry Core): Terry Yoshizumi
Agency: National Institute of Allergy and Infectious Diseases (NIAID), NIH
Type: Center Grant (5U19 AI067798-03-renewal)
Period: 8/31/2010- 7/31/2015

Radiation Dosimetry Laboratory- Core Dosimetry Service for Duke CT Institute
Principal Investigator for Center Grant: Terry Yoshizumi
Agency: Siemens Medical System
Type: Research Grant
Period: 01/01/2010 - 12/31/2010

Radiation Dosimetry Laboratory- Core Dosimetry Service for Duke CT Institute
PI: Terry Yoshizumi
Agency: GE Healthcare ($13,212)
Type: Research Grant
Period: 01/01/2010 - 12/31/2010

Duke University Health Physics Graduate Fellowship Program
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Graduate Fellowship Grant
Period: 9/1/2010-8/31/2011

Duke University Health Physics Summer Undergraduate Research Experience
PI: Terry Yoshizumi
Agency: U.S. NRC Nuclear Education Grant
Type: Graduate Fellowship Grant
Period: 6/1/2010-12/31/2010

5. FRANCIS MARION UNIVERSITY

Department of Physics and Astronomy
Telephone: (803) 661-1381 / Fax: (803) 661-4616
http://swampfox.fmarion.edu/

Program Director and Contact Information:

Dr. David Peterson
Department of Physics and Astronomy
Francis Marion University
P.O. Box 100547
Florence, SC 29502-0547
(843) 661-1445
dpeterson@fmarion.edu

Types of HP Degrees Granted:

B.S. in Health Physics

Enrollment and Graduates by Degree Type:

BS HP Enrollment (Spring 2010):	**24**
BS HP Graduates (2009-10 academic year):	**4**
BS HP Graduates (2008-09 academic year):	**4**

Remote Delivery of Course: None

Health Physics Faculty (≥25% FTE toward the HP program)

David M. Peterson, Chair and Professor of Physics (843-661-1445); Ph.D., North Carolina State University 1973; Nuclear Physics, Instrumentation. [dpeterson@fmarion.edu]

R. Seth Smith, Pee Dee Electric Cooperative Professor of Physics (843-661-1453); Ph.D., Louisiana State University 1986; Lasers, Electronics. [rsmith@fmarion.edu]

Derek Jokisch, Associate Professor of Physics/Health Physics (843-661-4653); Ph.D. University of Florida 1999; Health Physics. [djokisch@fmarion.edu]

Philip Fulmer, CHP**,** Associate Professor of Physics/Health Physics (843-661-1443); Ph.D., Texas A&M University 1993; Health Physics, Electronics. [pfulmer@fmarion.edu]

Other Faculty Contributing to the Health Physics Program

Jeannette Myers, Associate Professor of Astronomy
Larry Engelhardt, Assistant Professor of Physics
Todd Vaccaro, Assistant Professor of Physics
Joe Mehaffey, Instructor of Physics
Nick Loudon, Instructor of Physics

Student Financial Assistance

A variety of national and local scholarships are available to our students. Students are also required to participate in a paid summer internship and often participate in more than one.

Sponsored Research Activities in Health Physics

Counting laboratory – multiple stations with computerized MCAs with electronics and detectors, neutron howitzer (^{252}Cf source), manual TLD system, computational health physics hardware and software.

6. IDAHO STATE UNIVERSITY

Department of Physics Telephone: (208) 282-2350 / Fax: (208) 282-4649

Program Director:
Dr. Richard Brey Department of Physics,
Campus Box 8106
Idaho State University, Pocatello, ID 83209
email: brey@physics.isu.edu

HP Degrees Granted:
A.S. in Physics (Health Physics Emphasis)
B.S. in Physics (Health Physics Emphasis)
M.S. in Physics (Health Physics Emphasis) Ph.D. in Engineering and Applied Science (Health Physics Emphasis)

Remote Delivery of Course: Selected courses in the B.S., M.S., and Ph.D. programs are offered to remote locations within the state of Idaho in real-time via microwave video communication.

Health Physics Faculty (>25% FTE toward the HP program)

Richard R. Brey, C.H.P. (*Physics*) Director & Associate Professor of Health Physics (208) 282-2667

Ph.D., Purdue University 1994; Applied health physics, Environmental health physics, Internal dosimetry, Accelerator health physics brey@physics.isu.edu]

Thomas F. Gesell, (*Physics*) Professor of Health Physics (208) 282-3669; Ph.D., University of Tennessee 1971; Dosimetry, Environmental health physics. [gesell@physics.isu.edu]

Douglas P. Wells, C.H.P. (*Physics*) Associate Professor of Health Physics (208) 282-3986; Ph.D., University of Illinois at Urbana-Champaign 1990; Environmental health physics, Accelerator health physics. [wells@physics.isu.edu]

Jay F. Kunze, C.H.P. (*Engineering*) Professor of Engineering (208) 282-2902; Ph.D., Carnegie Mellon University 1959; Medical Physics, Reactor health physics, Low-level radiation health effects. [kunzejay@isu.edu]

John S. Bennion, C.H.P. (*Engineering*) Assistant Professor of Engineering (208) 282-3351; Ph.D., University of Utah, 1997; Reactor health physics, Low-level radiation health effects. [jbennion@isu.edu]

Adjunct Faculty

Mark Otis, Brad Schrader, George Clarke

Affiliate Faculty
Rick Cummings, Mark Davidson, Morris Hall, Tony James, Karen Langley, James O'Rear, Bryce Rich, Paul Ritter

Other Information

The Idaho State University (ISU) Health Physics Program, within the Department of Physics, operates two separate environmental radioactivity monitoring and assessment laboratories. These laboratories are equipped with state-of-the-art low-level radiation detection equipment and extensive human resources. Physics department faculty administer the Idaho Accelerator Center (IAC) which currently operates several accelerators including two Van de Graaff accelerators and seven electron LINAC accelerators. A special interest of the department is a recently acquired 30-MeV fast pulse (10 pico second pulse width) LINAC. The IAC will be increasing the number of available accelerators in the near future. Idaho State University's College of Engineering operates an AGN-201 research and training reactor. All of these facilities provide work opportunities and research resources for Health Physics Students. Additionally, the nearby Idaho National Environmental & Engineering Laboratory (INEEL) offers many collaborative opportunities for students to gain practical experience and to conduct thesis research in a Department of Energy (D.O.E.) environment. The Health Physics Program at Idaho State University is a participant in both the D.O.E. Applied Health Physics (AHP) Fellowship program administered by the Oak Ridge Institute for Science and Engineering (ORISE) and the D.O.E. Nuclear Engineering and Health Physics (NE/HP) Fellowship Program administered by the South Carolina Universities Research and Education Foundation (SCUREF). Nestled in the heart of the Rocky Mountains, ISU is located near several national parks and premier ski areas. Please see our web page at: http://www.physics.isu.edu.

Sponsored Research Activities in Health Physics (2003 – Present)

Environmental Assessment Laboratory (EAL)

Principal Investigator: Richard R. Brey **Agency:** US Department of Energy (through subcontracts) **Type:** Environmental Surveillance Contract **Period:** 1995 - present Idaho State University (ISU) operates the Environmental Assessment Laboratory (EAL). The EAL provides radiological analysis for various environmental surveillance organizations and educational opportunities for students. EAL personnel are also involved with various independent environmental research projects. The EAL serves as a state resource for performing and assisting in environmental research. Students learn environmental research techniques, analytical skills, and rules of compliance related to monitoring.

International Isotopes of Idaho Inc (I4)., FY 2003

Principal Investigator: Richard R. Brey **Agency:** I4 **Type:** Research Contract **Period:** Open ISU occasionally contributes to I4 productivity by performing sample analysis when I4 equipment happens to fail. ISU also occasionally performs specialty radioanalytical work for I4.

Tipaz Inc, FY 2002

Principal Investigator: Richard R. Brey, Rene Rodriguez, Bruce Mincher **Agency:** Tipaz Inc.,. **Type:** Research Contract **Period:** Open Tipaz inc., is interested in technology transfer. They needed ISU to perform a demonstration for their Japanese clients on the effectiveness of using LINAC electron beams in the degradation of PCB and the efficacy of employing different additives to the PCB contaminated transformer oils to improve efficacy of decomposition.

BNFL, Inc. – ANSI/HPS N13.1

Principal Investigator: Richard R. Brey **Agency:** British Nuclear Fuels Limited (BNFL) **Type:** Research Contract **Period:** 2003 - 2004 ISU is collaborating with Auxier and Associates, BNFL, and SAIC to assess the Advanced Mixed Waste Treatment Projects building 635 exhauster systems with respect to ANSI/HPS N13.1-1999.

BBWI Pulsed Accelerator Work
Principal Investigator: Richard R. Brey **Co-Investigators:** Rene Rodriguez, Bruce Mincher **Agency:** BBWI (Bechtel BWXT Idaho, LLC) **Type:** Research Contract **Period:** 2003 - 2004 The Idaho State University – Idaho Accelerator Center operates a fast pulse (50-pspulse width) linear accelerator. We will combine this machine with a pulsed laser and various low-energy photon spectroscopy devices to investigate high pressure/high temperature water radiolysis immediately after the ionizing radiation flash – of interest to generation IV reactor technology.

Bechtel BWXT Idaho, LLC FY 2003
Principal Investigator: Richard R. Brey, Rene Rodriguez **Agency:** BBWI **Type:** Research Contract **Period:** 2003 – 2004 ISU shall construct and configure a laser based spectroscopy system usable for acquiring spectra of hydroxyl radical in supercritical fluid water. The laser system is to be constructed at the Idaho Accelerator Center on the Idaho State University campus. The effort will require accelerator beam time. The laser system will be capable of delivering tunable UV radiation to a sample cell.

Global Technologies Inc,
Principal Investigator: Richard R. Brey **Agency:** Northwind Inc. **Type:** Research Contract **Period:** 2003 ISU is collaborating with GTI to investigate properties of liquid semi-conductors with potential application to new applications of fission technology. This is the first phase of potentially a multi-phase multi-year project.

Stoller Inc., Purchase of LSC FY 2003
Principal Investigator: Richard R. Brey **Funding Agency**: Stoller Inc. **Type**: Research Contract **Period:** 2003 ISU in continued collaboration with Stoller Inc.,/DOE-ID Purchased a Packard Liquid Scintillation

Counter to enhance EAL analysis capability.

Premier Technologies Inc., FY 2003
Principal Investigator: Richard R. Brey **Agency:** Premier Technology Inc. **Type:** Contract **Period:** 2003 ISU in collaboration with Auxier and Associates performed ANSI?HPS N13.1-1999 compliance testing on four portable exhauster units manufactured by Premier Technologies.

7. ILLINOIS INSTITUTE OF TECHNOLOGY

Department of Biological, Chemical, and Physical Sciences
Telephone: (312) 567-7986 / Fax (312) 567-3138

Program Directors:

Dr. Andrew Howard Associate Professor of Biology
Department of Biological, Chemical and Physical Sciences, IIT
email: howard@iit.edu

Dr. Laurence F. Friedman, CHP Senior Lecturer of Physics
Department of Biological, Chemical and Physical Sciences, IIT
email: friedmanla@iit.edu

IIT Health Physics Website: http://www.iit.edu/csl/bcps/psm/index_phy.shtml

HP Degrees Granted:
Professional Science Masters (PSM)
Certificate in Radiological Physics (RPHY)

Remote Delivery of Courses: Yes

Health Physics Faculty (>25% FTE toward the HP program)

Laurence F. Friedman, Senior Lecturer in Physics (312.482.1789); Ph.D. Rensselaer Polytechnic Institute 1962. Certified by the American Board of Health Physics. [friedmanla@iit.edu].

Andrew Howard, Associate Professor of Biology and Physics (312.567.5881); Ph.D. University of California San Diego 1981. Structural biology and crystallographic methods development. [howard@iit.edu].

Gocha Khelashvili, Assistant Research Professor of Physics (312.567.3019); Ph.D. Illinois Institute of Technology 2000. Developing technology for use with high-energy-photon linear accelerators used in cancer therapy. [khelshvalli@iit.edu].

Jeffrey Terry, Assistant Professor of Physics (630.252.9708); Ph.D. Stanford University 1997. Synchrotron radiation techniques, physics and chemistry of actinides [terryj@iit.edu].

Other Health Physics Faculty

Shih-Yew Chen (Adjunct), Strategic Area Manager, Risk and Waste Management, Environmental Sciences Division, Argonne National Laboratory (630.252.5880); Ph.D. University of Illinois at Champaign-Urbana, 1978.

Michael Stabin (Adjunct Professor), Assistant Professor of Radiology and Radiological Sciences at Vanderbilt University (615.322.3190); Ph.D. University of Tennessee 1996. [Michael.g.stabin@vanderbilt.edu].

Advisory Panel

Ronald L. Kathren, P.E., CHP, DEE Professor Emeritus, Washington State University; Past President, Health Physics Society

Joseph Parsons, Ph.D., CHP Senior Technical Advisor for Radiological Controls, U.S. Department of Energy

James Tarpinian, CHP Head, ESH Program, Brookhaven National Laboratory

Richard Vetter, Ph.D., CHP Radiation Safety Officer, Mayo Clinic; Past President, Health Physics Society

Paul Ziemer, Ph.D., CHP Head of School of Health Sciences, Purdue University; Past President, Health Physics Society

Samuel I. Baker, Ph.D., CHP Head, Radiation ALARA Program, Argonne National Laboratory

8. LINN STATE TECHNICAL COLLEGE

Nuclear Technology Program – Health Physics Specialization
Telephone: (573) 582-0817 / Fax: (573) 582-7330

Program Director:
Bruce Meffert Nuclear
Technology Program
Advanced Technology Center
2900 Doreli Lane Mexico,
Missouri, 65265

HP Degrees Granted:

Associate of Applied Science in Nuclear Technology with Health Physics Specialization

Remote Delivery of Course: None

Health Physics Faculty (>25% FTE toward the HP program)

Bruce Meffert, Instructor (573-473-9639); B.S. Meteorology Iowa State University 1991.
[bruce.meffert@linnstate.edu]

Other Information

Radiation Protection (Health Physics) is a specialization under the Nuclear Technology Program. This program meets non-site-specific requirements of the NANT ACAD 93-008 for Radiation Protection Technicians at power reactors as well as the DOE requirements for Radiological Control Technicians. A unique feature of this program is a 1-semester paid internship at a power reactor or other radiological facility. Program Health Physics-related courses include Radiation Sciences, Radiation Safety, Radiation Dosimetry, Radiation Detection, Radiation Protection, and Reactor Theory and Operation.

This program is a model program in collaboration with the development of a nation-wide AAS degree in Nuclear Technology presently being developed by the University of Missouri under U.S. Department of Labor Employment and Training Administration Award No. HG-15355-06-60.

9. LOUISIANA STATE UNIVERSITY

Department of Physics and Astronomy
Telephone: (225) 578-2163 / Fax: (225) 578-5855

Program Director:
Kenneth Hogstrom, PhD
Health Physics and Medical Physics Program Office
Department of Physics and Astronomy
490 Nicholson Hall Louisiana State University Baton Rouge, LA 70803-4001
email: medphys@phys.lsu.edu

HP Degree Granted:
MS in Health Physics and Medical Physics (Health Physics Concentration)

PhD in Physics

Health Physics Faculty (>25% FTE toward the HP program)

Kenneth Hogstrom, Professor of Physics; Director, Medical and Health Physics Program Office (225-5780590); PhD Rice University 1977; radiation therapy physics. [hogstrom@lsu.edu]

Edward N. Lambremont, Professor Emeritus of Nuclear Science (225-578-2163); PhD Ohio State University 1958; Radiation effects on biological systems, radiation safety, US Council for Energy Awareness spokesman on nuclear power.

Kenneth L. Matthews, Assistant Professor of Physics (225-578-2740); PhD University of Chicago 1997, Medical imaging physics, radiation detector design, nuclear instrumentation for imaging. kipmatth@lsu.edu]

Erno Sajo, Associate Professor of Physics (225-578-2762); PhD University of Lowell, 1990; Computer and mathematical modeling of aerosol transport, atmospheric dispersion; radiation transport applications in health physics and medical physics. nserno@lsu.edu]

L. **Max Scott**, Radiation Safety Officer, LSU System (225-578-4400); PhD Purdue University 1961; Radiation safety. [lscott6@lsu.edu]

Wei-Hsung Wang, Radiation Safety Officer, Assistant Professor of Physics, LSU Baton Rouge Campus (225578-2747); PhD, Purdue University; Radiation safety, external dosimetry. [weihsung@lsu.edu]

Mark L. Williams, Professor Emeritus of Physics (225-578-2745); PhD, University of Tennessee, 1979; Nuclear reactor physics, radiation transport theory, perturbation theory, and numerical methods for applications in health and medical physics. [medphys@phys.lsu.edu]

Other Faculty

Steven Bujenovic, Adjunct Assistant Professor of Physics (225-767-0847).
John Gibbons, Adjunct Assistant Professor of Physics (225-767-0847).
Sheldon A. Johnson, Adjunct Assistant Professor of Physics (225-767-0847).
William R. Lee, Adjunct Professor of Physics (225-578-2163).

Other Information
Students enrolled in the Medical Physics and Health Physics Program may choose to concentrate their Master's studies in either Medical Physics or Health Physics.

Visiting Faculty Financial Assistance
The department occasionally hosts sabbatical leave for visiting faculty. Financial arrangements are negotiated on an individual basis.

Student Financial Assistance
Nearly all students who are admitted into our program are offered financial aid. The Department offers fellowships and teaching assistantships with stipends up to $23,500. All students on financial aid are exempt from tuition. Fellowship students have no specific departmental responsibilities. Extra funding is also available for students travel to research facilities and conferences.

Research Facilities with the Physics and Astronomy Department
X-ray medical imaging laboratory Gamma ray medical imaging laboratory Radiotherapy equipment and dosimetry laboratories (Mary Bird Perkins Cancer Center) Kilocurie gamma irradiator facilities (Nuclear Science Center) Center for Advanced Microstructures and Devices (CAMD, 1.3 GeV synchrotron ring)

Professional Certification
The health physics concentration for the M.S. in Medical Physics and Health Physics prepares the student for Part I of the certification examination administered by the American Board of Health Physics. Eligibility of Part II of examination is based on professional experience.

Sponsored Research Activities in Health Physics (2003 – Present)

Collaborative Research Agreement with Brain Lab Novalis
Principal Investigator: K. Hogstrom **Agency**: Brain Lab Novalis **Type**: Collaborative Research **Period**: 2005 - 2008

Collaborative Research Agreement with Tomotherapy
Principal Investigator: K. Hogstrom **Agency**: Tomotherapy, Inc. **Type**: Collaborative Research **Period**: 2005 – 2007

Assessment and Remediation of Public Health Impacts due to Hurricanes and Major Flooding
Principal Investigator: I. Van Heerden **Co-Investigator:** Erno Sajo **Agency:** Louisiana Board of Regents Health Excellence Fund **Type:** Research **Period:** 2001 – 2006

Electronically-collimated radiation detector for hand-held and area-search applications
Principal Investigator: K. Matthews **Agency**: Department of Homeland Security **Type**: Research **Period**: 2005 – 2006

Direct Prostate Dosimetry using Radiological Markers
Principal Investigator: Erno Sajo **Agency**: Louisiana State University **Type**: Research **Period**: 2005

Center for Biological Computation and Visualization
Principal Investigator: Harold Silverman **Co-Investigators:** Erno Sajo, Mark L. Williams
Agency: Louisiana Board of Regents Health Excellence Fund **Type:** Research **Period:** 2000 – 2004

10. THE OHIO STATE UNIVERSITY

Nuclear Engineering Program Telephone: (614)
292-8519 / Fax: (614) 292-3163
http://rclsgi.eng.ohio-state.edu/nuclear/

Program Director:
Dr. Thomas E. Blue
Health Physics Program Director
Nuclear Engr. Program Suite 255
650 Ackerman Road Columbus, OH
43202

(614) 292-0629
email: blue.1@osu.edu

HP Degrees Granted:
M.S. in Nuclear Engineering (Health Physics Option)
Ph.D. in Nuclear Engineering (Health Physics Option)

Remote Delivery of Course: No

Health Physics Faculty (≥25% FTE toward the HP program)

Tunc Aldemir, Professor of Nuclear Engineering. (614-292-4627); Ph.D. University of Illinois 1978; Nuclear Engineering, dynamic system reliability analysis and computational methods in reactor core design, analysis and optimization. [aldemir.1@osu.edu]

Thomas E. Blue, Professor of Nuclear Engineering (614-292-0629); Ph.D. University of Michigan 1978; Radiation hardness testing of semiconductor electronic devices, radiation dosimetry, boron neutron capture therapy accelerator-based neutron source design. [blue.1@osu.edu]

Richard S. Denning, Adjunct Professor of Nuclear Engineering (614-294-7412); Ph.D. The University of Florida 1967; Nuclear facilities safety, probabilistic risk assessment, criticality safety and radiation shielding. [denning.8@osu.edu]

Audeen W. Fentimen, Associate Professor of Civil and Environmental Engineering and Geodetic Science, Chair of Nuclear Engineering Program (614-292-7930); Ph.D. The Ohio State University 1982; Nuclear waste management, criticality safety. [fentiman.1@osu.edu]

Brian K. Hajek, Instructor/Associate Chair of Nuclear Engineering; M.S. The Ohio State University 1972; (614-292-5405); Reactor operations and training, nuclear instrumentation, artificial intelligence, and safety system design [hajek.1@osu.edu]

Don W. Miller, Professor of Nuclear Engineering (614-292-7979); Ph.D. The Ohio State University 1971; Nuclear medical instrumentation, artificial intelligence applied to plant operations, digital x-ray radiography. [miller.68@osu.edu]

Other Faculty **Richard N. Christensen**, Emeritus Professor of Nuclear Engineering (614-292-0445); Ph.D. Stanford University 1974; Thermodynamics and heat transfer. [Christensen.3@osu.edu]

Nilendu Gupta, Assistant Professor of Radiology and Adjunct Assistant Professor of Nuclear Engineering (614-293-4204); Ph.D. The Ohio State University 1995; Boron neutron capture therapy, head scatter in Radiotherapy Linacs, scatter in Patient Dose Compensator Systems, Radiosurgery, 3D Treatment Planning and Conformal Radiation Therapy. [gupta.6@osu.edu]

Other Information

Typically receive annually one Institute for Nuclear Power Operations Health Physics Fellowship.

Student Financial Assistance

Financial assistance is available to Nuclear Engineering graduate students. Previous academic performance, GRE scores, and work experience are considered when selecting students for research assistantships, teaching assistantships, and fellowships. Fellowships are available through OSU, the Department of Energy, the Institute for Nuclear Power Operations, the Nuclear Regulatory Commission, and the National Science Foundation. Research assistantships are available on projects with faculty members as well as through cooperative agreements between the Nuclear Engineering Program and the Ohio Department of Health and the Ohio Emergency Management Agency. Stipends for all positions start at $1,400 per month; in addition, tuition and fees, which range from over $8,000 to about $20,000 per year, are waived. The deadline for fellowship applications is January 1.

Application for all forms of financial assistance administered by the Nuclear Engineering Program as well as the Graduate School may be made by simply completing the appropriate portion of the application form for admission to the Graduate School. Application materials may be obtained electronically (http://www.afa.adm.ohio-state.edu) or by writing to: Chair, Nuclear Engineering Program, The Ohio State University, Suite 255, 650 Ackerman Road, Columbus, OH 43202, USA

Research Facilities

500kW OSU Research Reactor(OSURR), graphite moderated natural-uranium fueled subcritical reactor, neutron howitzer, a 10,000 Ci Co-60 source in a water pool, Neutron Activation Analysis Laboratory, Nuclear Instrumentation Laboratory. Other on-campus facilities include: The Ohio Emergency Management Agency's Radiation Dosimeter Calibration Facility, Ohio Department of Health Bureau of Radiation Protection Emergency Response Laboratory, The James Comprehensive Cancer Center, OSU Hospital.

Sponsored Research Activities in Health Physics (2003 – Present)

Survival Experiments for Boron Neutron Capture Therapy
Principal Investigator: Thomas Blue **Co-Investigator:** Tatjana Jevremovic (Purdue), Rolf Barth, MD (Ohio State University); **Sponsor:** Pennsylvania State University administration of DOE INIE minigrant **Type:** Research Grant **Period:** 2004-2006 **Goal:** Determine effectiveness of various compounds for use in boron neutron capture therapy as measured by cell survival following neutron irradiation in the OSU Research Reactor thermal column cell irradiation facility.

Static and dynamic characterization of power and propulsion devices in gamma-ray and neutron/gamma-ray mixed-field radiation environments
Principal Investigator: Thomas Blue **Sponsor:** NASA **Type:** Research Grant **Period:** 2004-2006 **Goal:** Radiation hardness testing of power and propulsion devices in gamma-ray and neutron/gamma-ray mixed-field radiation environments

Static and Dynamic Characterization of Si Power MOSFETs, Si Rectifier Diodes, and Si/SiC Schottky Diodes in a Neutron and Gamma Environment
Principal Investigator: Thomas Blue **Sponsor:** NASA **Type:** Research Grant **Period:** 2004 Goal: Radiation hardness testing of power and propulsion devices in gamma-ray and neutron/gamma-ray mixed-field radiation environments

Summer employment for Carl Willis
Principal Investigator: Thomas Blue, **Sponsor:** Linac Systems, Albuquerque, NM; **Type:** Research Grant **Period:** 2004 **Goal:** Neutronic design calculations related to the development of an accelerator based neutron source for activation analysis

An Accelerator Neutron Source for BNCT (Boron Neutron Capture Therapy)
Principal Investigator: Thomas E. Blue **Agency:** Dept. of Energy **Type:** Research Grant **Period:** 1993 – 2005 **Goal:** Development of accelerator based neutron source for BNCT

Alternatives for Characterization and Removal of Deposits
Principal Investigator: Audeen W. Fentiman **Co-Investigator:** Bruce Bursten **Agency:** United States Enrichment Corporation/DOE **Period:** 2004 **Type:** Subcontract to USEC The purpose of this work is to explore possible methods for characterizing and removing U and Tc-99 deposits from equipment at the Portsmouth Gaseous Diffusion Plant prior to dismantling the facility.

OEMA/OSU Dosimeter Calibration Facility
Principal Investigator: Audeen W. Fentiman **Agency:** Ohio Emergency Management Agency **Type:** Grant **Period:** 2003-2004 The purpose of this project is to repair and calibrate dosimeters used by first responders and other emergency management personnel in Ohio, and occasionally to provide similar assistance to such personnel in neighboring states. In addition, OSU personnel help to develop and monitor systems designed to ensure safe operation of he calibration range.

Radiology Internship Program
Principal Investigator: Thomas E. Blue **Co-Investigator:** Richard Denning **Agency:** Ohio Department of Health **Type:** Training Grant **Period:** 2000 – 2003 **Goal:** Education and training

Accelerator-based Epithermal Neutron Source for BNCT
Principal investigator: Thomas E. Blue **Sponsor:** Linac Systems Linac Systems, Albuquerque, NM; **Type:** Research Grant **Period:** 2002 – 2003 **Goal:** Development of accelerator based neutron source for BNCT

11. OREGON STATE UNIVERSITY

Department of Nuclear Engineering and Radiation Health Physics
Telephone: (541) 737-2343 / Fax: (541) 737-0480 Website:
ne.oregonstate.edu

Program Director:
Dr. Kathryn A. Higley
Department of Nuclear Engineering and Radiation Health Physics
Oregon State University 116 Radiation Center
Corvallis, Oregon 97331-5902

(541) 737-0675
email: kathryn.higley@oregonstate.edu

HP Degrees Granted:
B.S. in Radiation Health Physics
M.S. in Radiation Health Physics
M.H.P. in Radiation Health Physics
Ph.D. in Radiation Health Physics

Remote Delivery of Courses: See http://ecampus.oregonstate.edu for current offerings.

Health Physics Faculty (≥25% FTE toward the HP program)

Stephen E. Binney, PE, CHP, Professor Emeritus; Director, Western Nuclear Science Alliance; Director Emeritus, Radiation Center (541-737-3018); Ph.D. University of California, Berkeley 1970; Applications of nuclear instrumentation and techniques, production of medical radioisotopes, boron neutron capture therapy, transmutation of radionuclides, nuclear radiation shielding. [binneys@rc.orst.edu]

Jack F. Higginbotham, PE, CHP, Professor; Director, Oregon Space Grant (541-737-9088); Ph.D. Kansas State University 1987; Instrumentation, research reactor applications, activation analysis, gamma-ray and beta-particle spectroscopy, radiation protection. [jackf.higginbotham@oregonstate.edu]

Kathryn A. Higley, CHP, Professor; Radiation Health Physics Program Director (541-737-0675); Ph.D. Colorado State University 1994; Human and ecological risk assessment, environmental pathway analysis, environmental radiation monitoring, emergency response. [higley@ne.orst.edu]

David M. Hamby, Professor (313-936-0764); Ph.D. University of North Carolina 1989; Environmental assessment, environmental transport and dosimetry, radiological instrumentation development and biokinetic modeling. [hambydm@ne.orst.edu]

Steven R. Reese, CHP, Director, Radiation Center (541-737-2344); Instructor; Ph.D. Colorado State University 1997; Radiation protection, activation analysis, radiation shielding and dosimetry, emergency response. [reeses@rc.orst.edu]

Other Faculty

Abi T. Farsoni, Associate Professor; Ph.D. Oregon State University 2006; radiation detection, digital signal processing. [abi.farsoni@oregonstate.edu]

Andrew C. Klein, PE, Professor; Ph.D. University of Wisconsin, Madison 1983; Space nuclear power applications, nuclear non-proliferation technology, nuclear system analysis and design, shielding. [kleina@ne.orst.edu]

Todd S. Palmer, Associate Professor (541-737-7064); Ph.D. University of Michigan, 1993; Numerical techniques for particle transport and diffusion, computational fluid dynamics, reactor physics, general numerical methods, nuclear criticality safety. [palmerts@ne.orst.edu]

Alena Paulenova, Associate Professor-Senior Research (541-737-7070); Ph.D. Moscow/Kharkov State University, 1985; Chemistry of actinides and fission products, radiochemical sensors, imaging, and therapy. [paulenoa@engr.orst.edu]

José N. Reyes Jr., Department Head and Professor; Director, Advanced Thermal Hydraulics Research Laboratory; Henry W, and Janice J. Schuette Endowed Chair Professor (541-737-7065); Ph.D. University of Maryland, 1986; Thermal hydraulics, multi-phase fluid flow studies, fluid-structure interactions, reactor system design, probabilistic risk assessment. [reyes@ne.orst.edu]

John C. Ringle, Professor Emeritus (541-737-7067); Ph.D., University of California-Berkeley, 1964; Radioactive waste management, environmental effects. [ringlejc@ne.orst.edu]

Brian G. Woods, Assistant Professor (541-737-6335); Ph.D. University of Maryland, 2001, Reactor thermal hydraulics, reactor safety, computational fluid dynamics, multi-phase/multi-species flow and heat transfer. [woodsbg@ne.orst.edu]

Qiao Wu, Associate Professor; Chair, Graduate Committee; (541-737-7066); Ph.D. Purdue University, 1995; Thermal hydraulics and reactor safety, reactor engineering, multi-phase flow and boiling heat transfer, uranium enrichment, reactor dynamics. [qiao@ne.orst.edu]

Other Information

Program is housed in the OSU Radiation Center, which has a 1.1 MW TRIGA reactor, ^{60}Co irradiator, instrument calibration facilities, radioecology greenhouse, as well as full analytical and laboratory capabilities. Other research facilities are the Advanced Thermal Hydraulic Research Laboratory (ATHRL) which incorporates three facilities: the Advanced Plant Experiment (APEX) to assess the safety systems of Westinghouse's next generation of nuclear power plants (AP600, APEX-CE, and AP1000); the Air-water Test Loop for Advanced Thermal-hydraulic Studies (ATLAS); and the Multi-application Small Light Water Reactor (MASLWR), a Generation IV design concept The Department also offers B.S., M.S., and Ph.D. degrees in nuclear engineering.

Sponsored Research Activities in Health Physics (2003 – Present)

A Multi-Layer Phoswich Radioxenon Detection System
Principal Investigator: David Hamby **Agency**: National Nuclear Security Administration **Type:** Research Grant **Period**: 2006-2009 Develop phoswich technology and digital signal processing for atmospheric radioxenon measurement.

Enhancing State-of-the-Art Beta Detection and Dosimetry
Principal Investigator: David Hamby **Agency**: US Department of Energy (NEER) **Type:** Research Grant **Period**: 2005-2008 Develop fieldable instrumentation for beta spectroscopy/dosimetry.

Center for Risk Evaluation and Stakeholder Participation
Principal Investigator: Kathryn A. Higley **Agency**: Vanderbilt University **Type:** Research Grant **Period**: 2006-2008 Provide technical assistance to the U.S. Department of Energy

Western Nuclear Science Alliance
Principal Investigator: Stephen E. Binney **Co-Investigators:** Andrew Klein, Steven Reese **Agency:** US Department of Energy, NE Office **Type:** Innovations in Nuclear Infrastructure and Education (INIE) Grant **Period:** 2002-2008 The goals of this research grant are to (1) upgrade research reactors and nuclear laboratories for classroom and research purposes, and (2) establish new education programs and scholarship programs.

SIRAD Neutron Sensitivity
Principal Investigator: Kathryn A. Higley **Agency**: TSWG **Type:** Research Grant **Period**: 2006 Evaluate the neutron sensitivity of the SIRAD self-indicating radiation dosimeter.

River Corridor Baseline Risk Assessment
Principal Investigator: Kathryn A. Higley **Agency**: Bechtel Hanford **Type:** Research Grant **Period**: 2005-2006 Collect and evaluate reports on radiological impacts to the Columbia River

Bioavailability of Radium Chips
Principal Investigator: Kathryn A. Higley **Agency**: MacTec, Inc **Type:** Research Grant **Period**: 2005 Assess the bioavailability of radium chips found at a superfund site

Advanced Beta Dosimetry Techniques
Principal Investigator: David Hamby **Agency**: US Department of Energy **Type:** Research Grant **Period**: 2002-2005 Develop fieldable instrumentation for beta spectroscopy/dosimetry.

Design of Neutron Beams for BNCT
Principal Investigator: Stephen Binney **Agency:** Civilian Research and Development Foundation (with Urkaine Colleagues) **Type:** Research Grant **Period:** 2002-2004 Design collimators to produce an optimal epithermal neutron beam for boron neutron capture therapy applications in the Kiev Research Reactor.

Radiological Emergency Response Training and Support
Principal Investigator: Steven Reese **Agency**: Oregon Department of Energy **Type**: Training Grant **Period:** 2000-2004 Hazmat training for emergency responders.

Measurement of Cross Sections Associated with Medical Isotopes
Principal Investigator: Stephen Binney **Agency:** US Department of Energy **Type:** Nuclear Engineering Education Research (NEER) Grant **Period:** 2001-2003 Measure certain neutron cross sections of unknown or uncertain value that are involved in the production of medical isotopes.

Atmospheric I-131 Dose Estimates Comparative Uncertainties
Principal Investigator: David Hamby **Agency:** PHS-Centers for Disease Control **Type:** Research Grant **Period:** 2000-2003 Determine uncertainties in the historical I-131 dose estimates calculated as part of dose reconstruction activities.

Probabilistic Dose Estimates for Environmental Dosimetry at the Savannah River Site
Principal Investigator: David Hamby **Agency**: Education, Research & Develop Assoc. of Georgia Universities **Type:** Research Grant **Period:** 2001-2003 Add uncertainty estimates to annual dose predictions at the Savannah River Site.

Research and Experimentation to Determine Source Efficiencies for Scabbed and Rough Concrete Surfaces
Principal Investigator: Kathryn Higley **Agency**: Portland General Electric Company **Type**: Research Grant **Period:** 2002-2003

12. PURDUE UNIVERSITY

School of Health Sciences 1338 Civil Engineering
Building West Lafayette, IN 47907-2051 Telephone:
(765) 494-1419 / Fax: (765) 496-1377
http://healthsciences.purdue.edu/

Director of Undergraduate Program in Radiological Health: Dr. Robert Stewart
Director of Graduate Program in Radiological Health: Dr. Jian Jian Li

Degrees Granted

B.S. in Health Physics (HP)
M.S. in Health Physics, Medical Physics (MP)
Ph.D. in Health Physics, Medical Physics, Radiation Biology (RB)

Radiological Health Faculty (≥25% FTE toward the HP program)

Ulrike Dydak, Assistant Professor (765-494-0550); Ph.D. ETH Zurich, Switzerland 2002; Physics – Methodological development in Magnetic Resonance Spectroscopy (MRS), including parallel Spectroscopic Imaging and multi-nuclear spectroscopy (31P, 13C, 23Na), for applications in clinical research and neuroscience. [udydak@purdue.edu]

Jian Jian Li, Professor, (765-496-6792); Ph.D. University of Iowa, 1994; Molecular radiation biology and the role of MnSOD in resistance to radiation damage. [jjli@purdue.edu]

Shuang Liu, Associate Professor, (765-494-0236); Ph.D. Memorial University of Newfoundland, St. John's, Newfoundland; Radiopharmaceutical Chemistry – Receptor-based target radiopharmaceuticals, bifunctional chelators, design/synthesis/evaluation of metal complexes as magnetic resonance imaging (MRI) contrast agents. [lius@pharmacy.purdue.edu]

George Sandison, FCCPM, Professor and Head (2000-2007), School of Health Sciences (765-494-1435); Ph.D. University of Manitoba; Medical Physics – radiation transport theory and dose calculations, radiation protection, dose optimization, cryotherapy, and imaging. [sandison@purdue.edu]

Keith Stantz, Assistant Professor, School of Health Sciences (765-496-1874); Ph.D. Indiana University, 1998; Physics – Physiological, molecular and biomolecular imaging; dynamic contrast-enhanced computed tomography (DCE-CT), photoacoustic CT-spectroscopy. [kstantz@pnhs.purdue.edu]

Robert Stewart, Associate Professor, School of Health Sciences (765-494-1444); Ph.D. Kansas State University; Nuclear Engineering – radiation physics, dosimetry, microdosimetry and radiation biology. [trebor@purdue.edu]

Other Health Sciences Faculty

Gary P. Carlson, Professor of Toxicology, Acting Head of the School of Health Sciences (2007-2008) **James D. McGlothlin**, Associate Professor of Industrial Hygiene and Ergonomics **Frank Rosenthal,** Associate Professor of Occupational and Environmental Health Sciences **Wei Zheng**, Professor of Health Sciences and Toxicology **Neil Zimmerman**, Associate Professor of Occupational Safety and Health

Courtesy, Visiting and Emeritus Faculty

John Christian, Emeritus Professor of Bionucleonics **Herman Cember, CHP,** Visiting Professor of Health Physics **Mark Green**, Professor of Nuclear Pharmacy **Tatjana Jevremovic**, Associate Professor of Nuclear Engineering **Robert Landolt**, Emeritus Professor of Health Physics **Stanley Shaw,** Professor of Nuclear Pharmacy **James Schweitzer,** Assistant Professor of Health Sciences and Radiation Safety Officer **Mack Richard**, Adjunct Clinical Professor of Radiological Health **Paul Ziemer**, Emeritus Professor of Health Physics

Purdue – Sponsored Radiological Health Research Activities (2003 – Present)

99mTc-Labeled Cyclic RGDfK Tetramers for Breast Cancer Imaging
Principal Investigator: Shuang Liu **Agency:** National Heart, Lung, and Blood Institute **Period:** 2006 – 2011 **Type:** 1 R21 HL08396-01 This project is related to the use of 99mTc-labeled RGDfK tetramers as radiopharmaceuticals for breast cancer imaging, and is specifically designed to examine the impact of 99mTc chelate, PKM linkers and peptide multiplicity on the uptake 99mTc-labeled RGDfK tetramers in tumor and other organs, such as kidneys and liver.

Novel Cationic 99mTc-Nitrido Complexes as Radiopharmaceuticals for Heart Imaging
Principal Investigator: Shuang Liu **Agency:** National Institute of Biomedical Imaging and Bioengineering **Period:** 2005 – 2008 **Type:** 1 R21 EB003419-01 This project is related to synthesis and biological evaluation of novel cationic 99mTc-nitrido complexes with a tridentate triphosphine coligand.

Novel Ternary Ligand 99mTc-Nitrido Complexes as Heart Imaging Agents
Principal Investigator: Shuang Liu **Agency:** NCI/NIH **Period:** 2006 – 2008 **Type:** 1 R01 RCA115883A This project seeks to evaluate novel cationic 99mTc-nitrido complexes with monoanionic bidentate coligands.

Implementation and Evaluation of Fast MRS Techniques for Brain and Body MRSI at 3T
Principle Investigator: Ulrike Dydak, Ph.D. **Agency:** IU-Siemens Pilot Funding Program for Imaging **Type:** IU-Siemens Research Grant **Period:** 2007-2009 To study, evaluate and implement fast Magnetic Resonance Spectroscopic Imaging techniques at 3 Tesla for brain and body spectroscopic imaging applications

Monte Carlo Simulation of ^{90}Y Microsphere Deposition in the Vasculature of Normal and Malignant Liver Tissue
Principal Investigator: Robert D. Stewart **Agency:** Purdue Research Foundation **Type:** Research Grant **Period:** 2007 Develop a Monte Carlo model to simulate the movement of microspheres through blood vessels

Role of MnSOD in Acquired Resistance to Cancer Therapy
Principal Investigator: Jian Jian Li, Ph.D. **Agency:** National Institutes of Health **Type:** RO1 Research Grant **Period:** 2004-2009 To study the molecular mechanism of radiation resistance of human cancer cells with reconstitution of MnSOD.

MDCT in the Evaluation of Cardiac Perfusion in a Porcine Model
Principal Investigator: Keith Stantz **Agency:** Philips Medical Systems **Type:** Subcontract **Period:** 2002-2004 To study the correlation between coronary heart disease and (the lack of) myocardial perfusion implementing ECG-gated high-speed multi-slice CT system.

Regulation of NF-KB and MnSOD in Low Dose Radiation Induced Adaptive Protection of Mouse and Human Skin Cells
Principal Investigator: Jian Jian Li. Ph.D. **Agency:** Department of Energy **Type:** Research Grant **Period:** 2003-2006 To combine advanced micro array technology with signaling transduction studies to determine the functions of transcription factor NF-KB and mitochondrial antioxidant MnSOD in cell adaptive response to ionizing radiation**.**

Towards Constructing and Testing a Virtual Tissue
Principal Investigator: Robert D. Stewart **Co-Investigators:** K. Jennings, R.K. Ratnayake, J. Park **Agency:** U.S. Department of Energy Office of Science (BER) **Type:** Research Grant (DE-FG02-03ER63665) **Period:** 2003 to 2005 Develop a system of models, termed the *Virtual Tissue* (VT), to simulate key molecular, cellular and microevolutionary processes involved in tumor formation. The VT will simulate the growth and interaction of normal and aberrant cells in a dynamic tissue microenvironment. Strategies to estimate key model inputs and confidence intervals on these estimates will be developed.

Molecular Energetics of Clustered Damage sites
Principal Investigator: Robert D. Stewart **Co-Investigators:** M. Dupuis (PNNL), V.A. Semenenko **Funding Agency:** Pacific Northwest National Laboratory (PNNL) **Type of Award:** Research Grant (415294-A9E-P6028). **Period:** 2002 to 2005 Use computational chemistry models to characterize the structure, energetics, and spectroscopy of singly and multiply damaged (clustered) DNA sites. Project is associated with a larger DOE Office of Science project of the same name (M. Dupuis, Principal Investigator).

Kinetic Modeling of Damage Repair, Genome Instability, and Neoplastic Transformation
Principal Investigator: Robert D. Stewart **Co-Investigators:** E.J. Ackerman (PNNL), V.A. Semenenko **Agency:** U.S. Department of Energy Office of Science (BER) **Type:** Research Grant (DE-FG02-03ER63541) **Period:** 2001 to 2004 Develop a system of models (i.e., the *Virtual Cell*) to study the putative links between inducible repair of DNA damage and the induction of genomic instability and the killing or transformation of cells. As part of this project, we are also developing detailed Monte Carlo models for the base and nucleotide excision repair of some types of clustered DNA damage sites (see also the *Molecular Energetics of Clustered Damage Sites project*).

13. RENSSELAER POLYTECHNIC INSTITUTE

Nuclear Engineering and Engineering Physics Program Department of Mechanical, Aerospace, and Nuclear Engineering (MANE)
110 8th Street, Troy, NY 12180-3590 Telephone:
(518) 276-6650 / Fax: (518) 276-4832
http://www.rpi.edu/dept/mane/deptweb/index.html

Program Director:

Dr. X. George Xu
Nuclear Engineering and Engineering Physics Program Department of Mechanical, Aerospace, and Nuclear Engineering (MANE)
NES Building, Tibbits Avenue Troy, NY 12180-3590
Telephone: (518) 276-4014 / Fax: (518) 276-4832
E-mail: xug2@rpi.edu

HP Degree Granted:

B.S. in Nuclear Engineering/Engineering Physics (health physics option)
M.S. in Nuclear Engineering/Engineering Physics (health physics option)
Ph.D. in Nuclear Engineering/Engineering Physics (health physics option)

Remote Delivery of Course: None

Health Physics Faculty (≥25% FTE toward the HP program)

Peter Caracappa, Clinical Assistant Professor and Institute Radiation Safety Officer; Ph.D.. Rensselaer Polytechnic Institute 2006; Health physics. [caracp3@rpi.edu]

Yaron Danon, Associate Professor and director of LINAC Lab; Ph.D. Rensselaer Polytechnic Institute 1993; Radiation transport, shielding design, nuclear instrumentation, x-ray imaging. [danony@rpi.edu]

Li "Emily" Liu, Assistant professor; Ph.D. Massachusetts Institute of Technology, 2005. Neutron physics [lieu@rpi.edu]

Richard T. Lahey, Jr. The Edward E. Hood Professor of Engineering; Ph. D. Stanford University 1971; multiphase flow, heat transfer technology, nuclear safety. [laheyr@rpi.edu]

Bimal K. Malaviya, Executive Officer and Professor; Ph.D. Harvard University 1964; Radioactive waste management, fission and fusion reactor physics and technology, biomedical applications, human factor engineering [malavb@rpi.edu]

Michael Z. Podowski, Professor; Ph.D. Warsaw Technical University 1972; Nuclear safety, system stability, applied mathematics, multiphase flow and heat transfer. [podowm@rpi.edu]

Don Steiner, Research Professor; Ph.D. Massachusetts Institute of Technology 1967; Radiation physics, fusion systems analysis, plasma engineering, blanket design and overall fusion reactor design, nuclear instrumentation, environmental assessment [steind@rpi.edu].

X. George Xu, Professor; Ph.D. Texas A&M University 1994; Internal and external radiation dosimetry, Monte Carlo simulations, anatomical whole-body model development, medical health physics, Monte Carlo application in radiotherapy, radiology, and nuclear medicine, in-situ gamma spectroscopy, environmental health physics. [xug2@rpi.edu]

Other Information

Health physics is an integral part of the Nuclear Engineering and Engineering Physics Program which is administered through the Department of Mechanical, Aerospace, and Nuclear Engineering (MANE) at Rensselaer Polytechnic Institute, the nation's oldest engineering school. Students in health physics degree concentration receive degrees in nuclear engineering or engineering physics after completing core courses and research project in health physics. Rensselaer Polytechnic Institute has one of the nation's most outstanding nuclear engineering programs, and has provided a large number of highly qualified 'Can-Do" graduates to nuclear industry, national laboratories and academia over the past 40 years. Active collaborations in health physics teaching and research have been established with Albany Medical Center, New Your State Department of Health, nuclear power plants in New York State, Knoll Atomic Power Laboratory and GE/CRD, as well as several national labs.

Off-campus site: In cooperation with the U.S. Navy, the department has been offering undergraduate degree programs in Engineering Science and Nuclear Engineering to Navy personnel stationed at the Kesselring site in West Milton, New York. Programs and classes are mainly delivered at our Malta Commons campus (30 miles from Troy campus). The course schedules have been designed to accommodate the shift work schedule of about 60 students who are currently enrolled.

Visiting Faculty

Many visiting and adjunct faculty are currently involved in health physics teaching and research in the department.

Student Financial Assistance

Graduate teaching and research assistantships (partial or full stipend and tuition) are awarded each year to incoming students.

Research Facilities

Major nuclear engineering facilities include a 100-MeV electron accelerator and a 5-W research reactor. Rensselaer Polytechnic Institute's Troy campus is one of the most computerized campuses in the nation, and has been constantly ranked among the top five "Most Wired" universities nationwide by Yahoo.

Sponsored Research Activities in Health Physics (2003 – Present)

4D Visible Human Modeling for Radiation Dosimetry

Principal Investigator: X. George Xu **Agency:** National Institutes of Health /NLM 1R01LM009362-01 **Type:** Research Grant R01 **Period:** 2007-2011 The goal of the project is to use the segmented 3D Visible Human dataset form the National Library of Medicine to create a physics-based motion-simulating (4D) anatomical and dosimetric model for external photon radiation treatment planning.

Bioassay Phantoms Using Medical Images and Computer Aided Manufacturing

Principal Investigator: X. George Xu **Agency:** Department of Energy / Nuclear Eng Education Research (NEER) Program (DE-FG07-06ID1003) **Type:** Research Grant **Period:** 2007-2010

The goal of the project is to develop a method of using medical image data to fabricate physical phantoms that are used for health physics applications in nuclear power industry.

Virtual Patients for Computing Radiation Doses
Principal Investigator: X. George Xu **Agency:** National Institutes of Health/NCI (R01CA116743) Type: Research Grant R01 **Period:** 2005-2008 New patient models of both genders and different ages are developed for dosimetry studies involving different clinical procedures in radiation treatment, nuclear medicine and diagnostic imaging.

Realistic Phantom Series For Olinda/Exm Version 2
Principal Investigator: X. George Xu (subcontractor of RADAR) **Agency:** National Institutes of Health/NCI (1 R42 CA115122-01) **Type:** STTR Research **Period:** 2005-2008 Nuclear medicine dosimetry software package is developed with new patient models.

Interactive VIP-Man Dose Simulation Tools
Principal Investigator: X. George Xu **Agency:** Electric Power Research Institute (EPRI) **Type:** Research Grant **Period:** 2003-2004 Effective dose equivalent is assessed for nuclear power plant workers using advanced modeling and measurement tools.

14. SAN DIEGO STATE UNIVERSITY

Department of Physics Telephone: (619) 594-6240 /
Fax: (619) 594-5485

Program Director:
Dr. Patrick J. Papin
Department of Physics
San Diego State University
San Diego, California 92182-1233
email: ppapin@sciences.sdsu.edu

HP Degrees Granted:
M.S. in Radiological Health Physics

Remote Delivery of Course: None

Health Physics Faculty (≥25% FTE toward the HP program)

Patrick J. Papin, Ph.D., Professor of Physics (619-594-6240); Ph.D. University of California 1985, Computational methods in dosimetry and medical imaging. [ppapin@sciences.sdsu.edu]

Gordon Shackelford, Lecturer in Radiological Physics (619-594-6240); M.S. San Diego State University 1974, Nuclear instrumentation and methods. [gshackelford@sciences.sdsu.edu]

Robert Nelson, Ph.D., Lecturer in Radiological Physics (619)594-6240; Ph.D. University of California 1986, Medical Imaging. [rnelson@sciences.sdsu.edu]

Ralph Cerbone, Ph.D., Lecturer in Radiological Physics (619-594-6240); Ph.D. Rensselaer Polytechnic Institute 1967, Computational methods in shielding, nuclear engineering.

Other Faculty **Steven J. Goetsch, Ph.D.**, Lecturer in Radiological Physics. **Mark Young, M.S.** Lecturer in Radiological Physics. **Eric Goldin, Ph.D.**, Lecturer in Radiation Biophysics.

Other Information
Health/Medical Physics curriculum includes applied health/medical physics courses in areas of nuclear power reactor health physics (in cooperation with San Onofre Nuclear Generating Station) and medical physics (in cooperation with various medical centers in the San Diego area).

Student Financial Assistance
The department currently supports students as both teaching and research assistantships. Students also have numerous opportunities for scholarships and fellows.

Professional Certification
Graduates of our program have been very successful in passing the American Board of Health Physics Certification Exam.

Research Facilities

On campus facilities include: Nuclear counting laboratories with radioisotope preparation capabilities, x-ray laboratory, whole-body counter, instrument calibration facility (including gamma and neutron sources), computational radiological physics laboratory (with high-speed supercomputer access). Off campus facilities: Through elective courses and special study students have access to equipment and facilities at San Onofre Nuclear Generating Station, various hospitals (with nuclear medicine, diagnostic and radiation therapy facilities), and biotech laboratories.

15. TEXAS A&M UNIVERSITY

Department of Nuclear Engineering Telephone:
(979) 845-4161 / FAX: (979) 845-6443

Program Director:
John W. Poston, Sr., Ph.D.
Department of Nuclear Engineering
3133 TAMU Texas A&M University
College Station, TX 77843-3133
email: j-poston@tamu.edu

Degrees Granted:
B.S. in Radiological Health Engineering (ABET accredited)
M.S. in Health Physics Ph.D. in Nuclear Engineering
(Health Physics Option)

Remote Delivery of Courses: On-demand

Health Physics Faculty (≥25% FTE toward the HP program)

Leslie A. Braby, Research Professor (979-862-1798); Ph.D. Oregon State University 1972; Microdosimetry, radiation biology, space radiation, radiation detection. [labraby@tamu.edu]

John R. Ford, Assistant Professor (979-847-9492); Ph.D. University of Tennessee-Knoxville 1992; Radiation carcinogenesis, radiation biology. [ford@ne.tamu.edu]

William H. Marlow, Professor of Nuclear Engineering (979-845-2271); Ph.D. University of Texas at Austin 1973; Physics of molecular clusters and small particles. [w-marlow@tamu.edu]

John W. Poston, Sr., Professor of Nuclear Engineering and Program Dirrector(979-845-4161); Ph.D. Georgia Institute of Technology 1971; External and internal dosimetry, applied health physics. [j-poston@tamu.edu]

Warren D. Reece, Professor of Nuclear Engineering and Director, Nuclear Science Center (979-847-8946); Ph.D. Georgia Institute of Technology 1988; Radiation transport, assessment of effective dose equivalent, medical applications for radionuclides. [w-reece@tamu.edu]

Other Faculty -None

Other Information
Texas A&M University is an approved site for the DOE Nuclear Engineering & Health Physics Fellowship, the DOE Applied Health Physics Fellowship and the NANT Health Physics Fellowship.

Visiting Faculty Financial Assistance
Faculty wishing to spend a sabbatical leave at Texas A&M University are welcome. Financial arrangements are negotiated on an individual basis but may encompass half-time to full support for the academic year. The Department has a long history of such arrangements with several national laboratories, as well as some foreign institutions.

Student Financial Assistance Programs

Scholarships, fellowships, and assistantships are available through the Department, the College and the University. All applications for our graduate program are *automatically* considered for financial aid. The Department is an approved site for the DOE Applied Health Physics Fellowship, the DOE Nuclear Engineering and Health Physics Fellowship, and the NANT Health Physics Fellowship.

Research Facilities

1 MW TRIGA research reactor, 5 W AGN-201M training reactor, 5 accelerators, Microbeam Facility, Nuclear Counting Laboratory, Radon Laboratory, Thermoluminescence Dosimetry Laboratory, Nuclear Spectroscopy Laboratory, Liquid Scintillation Counting Laboratory, Environmental Measurements Laboratory, Radiochemistry Laboratory, and two Radiation Biology Laboratories. A $10,000,000 state-of-the-art food irradiation facility has been on-line since spring 2002.

Professional Certification

The B.S., M.S. and Ph.D. programs in health physics prepare the student for Parts I & II of the American Board of Health Physics (ABHP) certification examination. Further eligibility for Part II of the examination is based on professional experience and achievement. In addition, the B.S. degree in Radiological Health Engineering is accredited by ABET. Students completing this degree are eligible for examinations leading to a Professional Engineer license.

Sponsored Research Activities in Health Physics (2003 – Present)

A Combined Tissue Kinetics and Dosimetric Model of Respiratory Tissue Exposed to Radiation
Principal Investigator: John Ford **Co-Investigators:** None **Agency:** US Department of Energy NEER **Type:** Research Grant **Period:** 2002 - 2005 The project will develop a computer model of respiratory cells in culture and in tissues. The model will simulate the normal growth, proliferation and loss by apoptosis of human cells. Once the model accurately depicts the unperturbed growth of cells in culture we will introduce changes due to irradiation.

Low dose response of respiratory cells in intact tissues and reconstituted tissue constructs
Principal Investigator: John Ford **Co-Investigators:** Leslie Braby **Agency:** US Department of Energy LDRRP/ NASA **Type:** Research Grant **Period:** 2002 - 2005 Human cells grown in three-dimensional tissue constructs will be irradiated by microbeams or HZE particles. The intention is to image the response of the cells in thin slices by a combination of fluorescence microscopy and 3-D deconvolution.

NORM Issues Associated with Commercial Cleaning of Oil Production Tubulars
Principle Investigator: Ian S. Hamilton **Co-Investigator**: John W. Poston, Sr., James C. Rock **Agency:** Adams and Reese LLP (private sponsor) **Type:** Research **Period**: 2002 - 2004 The purpose of this research was/is to characterize the aerodynamic and radioactive properties of pipe scale dusts generated in the “rattling” of production tubulars from various formations, e.g., mass loading and particle size distribution, activity concentration, radon emanating power and concomitant fluxes, and solubility in lung fluids.

Risk Assessment Peer Review
Principle Investigator: Ian S. Hamilton **Agency:** BWXT Pantex **Type:** Research/review **Period**: 2003 - 2004 The goal of this project was to review all pertinent data sources and methods used to conduct a screening process in preparation for a baseline risk assessment to support CERCLA delisting.

USDOE University Reactor Instrumentation Program (URI)
Principle Investigator: Ian S. Hamilton **Co-Investigator**: Warren D. Reece **Agency:** USDOE **Type:** Reactor instrumentation upgrade **Period**: 2002 - 2004 The purpose of this grant was to upgrade undergraduate detection laboratory capabilities in support of a reactor experiments laboratory course.

Gene Expression Patterns Predictive of Radiation-Enhanced Colon Tumorigenesis: Diet as a Countermeasure
Principal Investigator: Joanne Lupton **Co-Investigators:** Nancy Turner, John Ford, Leslie Braby and Robert Chapkin **Agency:** NASA **Type:** Research Grant **Period:** 2003 - 2004 The project aims to determine whether diet can be used to minimize the potential for cosmic gamma-rayinduced colon cancer and to enhance immune function in space. Another goal is the development of effective intermediate markers of potential cancer induction using non-invasively acquired mRNA's.

Nutritional Countermeasures to Radiation Exposure
Principal Investigator: Joanne Lupton **Co-Investigators:** Nancy Turner, John Ford, Leslie Braby and Robert Chapkin **Agency:** National Space Biomedical Research Initiative / NASA **Type:** Research Grant **Period:** 2001 - 2004 The project aims to determine whether diet can be used to minimize the potential for cosmic gamma-rayinduced colon cancer and to enhance immune function in space.

A Revised Model for Dosimetry in the Small Intestine
Principal Investigator: John W. Poston, Sr. **Co-Investigators:** none **Agency:** Department of Energy, NEER Grant (DE-FG07-021D14335, A001) **Type:** Research Grant **Period:** 2002 – 2004 The specific aim of this research is to completely redesign and improve the mathematical model for the small intestine. Once the model is complete, calculations will be performed for monoenergetic electron sources in the contents of the small intestine. These data will be used to recalculate the annual limit on intake values and the derived air concentration values for radionuclides for which the gastrointestinal tract is controlling.

Mechanistic Modeling of Bystander Effects: An Integrated Theoretical and Experimental Approach
Principal Investigator: Leslie A. Braby **Co-Investigators:** John R. Ford **Agency:** US Department of Energy, OBER **Type:** Research Grant **Period:** 2001 - 2004 The goal of this project is to evaluate radiation induced effects in unirradiated cells as a function of distance from cells irradiated by an electron microbeam and of the characteristics of irradiated cell. Biological endpoints such as repair protein levels and micronucleus frequencies induced by cellular communication are evaluated. Results are used in developing mechanistic models of radiation damage at low doses.

Recommendation of Radiation Dosimetry Methodology
Principal Investigator: John W. Poston, Sr. **Co-Investigators:** Matthew G. Arno **Agency:** Sandia National Laboratories (C03-00338)) **Type:** Research Grant **Period:** 2003 – 2004 The project will include the development of a radiation dosimetry method for acute inhalation exposure and studies of the neutron dose quality factor. The focus is early and acute radiation effects produced by radiological weapons of mass destruction.

Stochastic Modeling of the Cell Killing Effects of Low- and High-LET Radiation
Principal Investigator: W. D. Reece, Julien Partouche **Agency:** DOE/INIE **Type:** Research Contract **Period:** 2002 - 2004 Evaluate the accuracy of the non-stochastic repair-misrepair (RMR) model as a function of dose, dose rate and linear energy transfer (LET). Examine the relationship between particle LET and RMR-model biological parameters. Investigate methods to better incorporate stochastic fluctuations in DNA damage formation and repair processes into a non-stochastic RMR model.

Advanced Neutron Irradiation System Using Texas A&M University Nuclear Science Center
Principal Investigator: W. D. Reece, Si-Young Jang **Agency:** DOE/INIE **Type:** Research Contract **Period:** 2002 - 2004 The objective of this study is to develop a heavily filtered fast neutron irradiation system (FNIS) that will be used to evaluate the biological mechanisms that lead to long-term health effects of neutrons using experimental systems such as rats or with cultured cells. In addition, the FNIS should be used to test electronic parts such as integrated circuit (IC) chips and semiconductors with fast neutrons.

Texas Partnership
Principal Investigator: Alan Waltar **Co-Investigators:** Lee Peddicord, Marvin Adams, John Ford, Paul Nelson **Agency:** US Department of Energy MMUPP **Type:** Grant **Period:** 2001 - 2004 The goals of this project were to establish a pipeline for students to graduate school and involved the Physics department at Texas A&M University-Kingsville and the Engineering Department at Prairie View A&M University.

Measurement of Particles Spontaneously Produced by Plutonium
Principal Investigator: William H. Marlow **Agency:** U. S. Department of Energy , through Lovelace Respiratory Research Institute from Los Alamos National Laboratory **Type:** Research Grant **Period:** 2002 - 2003 The purpose of this project was to analyze, interpret, and write for publication the results of the measurements we initiated of the characteristics of plutonium particles released from the surface of a solid plutonium oxide material as a result of the radioactive decays occurring within the material.

Collaborative Linkage Grant with Obninsk
Principal Investigator: Lee Peddicord **Co-Investigators:** Ian Hamilton, John Ford, John Poston, Dan Reece, and others. **Agency:** NATO **Type:** Grant **Period:** 2001 - 2003 The goals of this project were to make collaborative connections between Texas A&M University and the Russian Institutions at Obninsk for the purposes of furthering cleanup and decommissioning efforts in Russia.

16. TEXAS STATE TECHNICAL COLLEGE WACO

Environmental Health & Safety Technology/Health Physics Specialization
Telephone: (254) 867-3384 / Fax: (254) 867-3381

Program Director:
Linda Morris (Linda.Morris@tstc.edu)
Environmental Health & Safety Technology
3801 Campus Drive
Waco, TX 76705
254-867-2952

HP Degrees and Certificates Offered:
Advanced Technical Certificate-Health Physics
AAS Degree Radiation Protection Technology (2010-2011)

Remote Delivery of Course: None

HP Certificate Enrollment (Spring 2010): 19

HP Certificate Graduates (2009-2010): 6

HP Certificate Graduates (2008-2009): 6

Health Physics Faculty

Linda Morris, Associate Professor and Department Chair for Environmental Health & Safety Technology. M.S. Biophysics (Health Physics) Texas A&M University. HPS Fellow.
Kenneth Krieger, CHP, Nuclear Technologies Coordinator and Instructor. Office: 254-867-2954. M.S. Health Physics, Texas A&M University. Kenneth.Krieger@tstc.edu

Other Information
The radiation protection technology program was first offered in the 1970s at Texas State College Waco making it one of the oldest such programs in the United States.
With the expansion and contraction of the nuclear industry, the program has expanded and contracted to match, but the College has always continued to offer courses, degrees, and certificates in health physics. College graduates with a degree related to radiation safety can obtain an Advanced Technical Certificate in Health Physics (ATC).
The program is tentatively scheduled to return as a full Associate of Applied Science in Radiation Protection Technology for the 2010-2011 college year.

TSTC Waco has an active Student Branch which also participates in South Texas Chapter and national HPS conferences and activities.

The program also has grants to support scholarships, equipment, and student learning activities from the Nuclear Regulatory Commission, the Texas Nuclear Power Institute, and the U. S. Department of Labor.

17. Thomas Edison State College

School of Applied Science and Technology
Telephone: 888-442-8372
Fax of Admission Office: 609-984-8447
College Web Page: www.tesc.edu
School of Applied Science and Technology: http://www.tesc.edu/758.php

Health Physics Programs:

Associate of Science in Radiation Protection http://www.tesc.edu/2444.php
Associate of Science in Radiation Therapy
Bachelor of Science in Radiation Protection http://www.tesc.edu/2603.php
Bachelor of Science in Radiation Therapy http://www.tesc.edu/2598.php

Program Director and Contact Information:

Dr. Marcus Tillery
Dean, School of Applied Science and Technology

Address:
101 West State Street
Trenton, New Jersey 08608

Telephone: 609-984-1130
Fax: 609-984-3898

Types of HP Degrees Granted:

Associate of Science in Radiation Protection
Associate of Science in Radiation Therapy
Bachelor of Science in Radiation Protection
Bachelor of Science in Radiation Therapy

Enrollment and Graduates by Degree Type

BS HP Enrollment (2009-10 academic Year): 51
BS HP Graduates (2009-10 academic year): 5
BS HP Graduates (2008-09 academic year): 9

Remote Delivery of Course: (yes or no)

Yes. Thomas Edison State College serves adult students at a distance.

Health Physics Faculty (≥25% FTE toward the HP program) (List names, contact information, and research interests)

N/A

The College contracts with subject matter experts to act as mentors to academic units of the College.

Other Faculty Contributing to the Health Physics Program

N/A

Research Facilities

N/A

Sponsored Research Activities in Health Physics

N/A

Other Information

Thomas Edison State College provides flexible, high-quality, collegiate learning opportunities for self-directed adults. The flexible ways of earning credits includes credit by examination, assessment of experiential learning, guided study, online courses, e-pack courses and credit for licenses and certifications, corporate and military training.

18. UNIVERSITY OF CINCINNATI

Department of Mechanical, Industrial & Nuclear Engineering Telephone: (513) 556-2003/Fax: (513) 556-3390

Program Director:
Henry B. Spitz
Department of Mechanical, Industrial & Nuclear Engineering
598 Rhodes Hall
Cincinnati, Ohio 45221-0072
(513) 556-2003 Email:
henry.spitz@uc.edu

Degrees Granted:
MS in Health Physics
MS & PhD in Nuclear Engineering
MS & PhD in Radiological Engineering
PhD in Medical Physics

Remote Delivery of Courses: Available to matriculated students only.

Health Physics Faculty (25% FTE toward HP Program)

Henry Spitz, Professor and Graduate Studies Director (513-556-2003); Ph. D. New York University, 1978: Internal radiation dosimetry, bioassay and *in vivo* measurements, calibration phantoms, tissue substitutes; radiation detection & measurements, environmental radioactivity. [henry.spitz@uc.edu]

John Christenson, Professor and Nuclear & Radiological Engineering Program Director (513-556-2002); Ph. D., University of Wisconsin 1970: Nuclear reactor kinetics and system dynamics, probabilistic determination of reactor operability rules, optimal control of nuclear reactors. [john.christenson@uc.edu]

Bingjing Su, Associate Professor; Ph. D., University of California, Los Angeles, 1995: Analytical and numerical methods for radiation transport calculations; reactor physics; mathematical modeling and numerical computation; signal surveillance technology. [bingjing.su@uc.edu]

Ivan Maldonado, Associate Professor, Ph. D., North Carolina State University, Raleigh, NC, 1993: Computational engineering applications to core reactor physics and nuclear fuel cycle management. Numerical methods, perturbation theory, optimization techniques, and artificial neural networks as applied to large-scale simulations. [Ivan.Maldonado@uc.edu]

Leroy Eckart, Professor and Associate Dean (513-556-2739); Ph. D. University of Cincinnati, 1971: Radiological engineering, risk assessment, pathway analysis, nuclear waste management. [roy.eckart@uc.edu]

Samuel Glover, Adjunct Assistant Professor (513 556 2052); Ph. D., Washington State University, 2001: Nuclear radiochemistry, neutron activation analysis, internal radiation dosimetry. [samuel.glover@uc.edu]

Adrian Miron, Research Assistant Professor (513 556 2543); Ph. D., University of Cincinnati, 2001: Nuclear Engineering, Radiological Engineering, Pathway Analysis. [adrian.miron@uc.edu]

Howard Elson, Clinical Professor, Ph. D. University of Cincinnati 1980: Medical Physics, radiation oncology. [elsonhr@healthall.com]

Other Faculty
James Neton, Ph. D., CHP, Adjunct Assistant Professor
Raymond Wood, Ph. D., Adjunct Assistant Professor
Eugene Rutz, M. S., Research Assistant Professor

Other Information
The Health Physics Program is part of a comprehensive, interdisciplinary academic program in Nuclear and Radiological Engineering in the College of Engineering at the University of Cincinnati. Although Nuclear and Radiological Engineering is located in the Department of Mechanical, Industrial and Nuclear Engineering, collaborations in academic and research activities with the Department of Environmental Health in the College of Medicine, the Radiology Department in the College of Medicine, and Civil and Environmental Engineering in the College of Engineering are typically arranged to provide students with the greatest possible range of experience. All students are required to complete a research thesis or project for the MS degree. Students receiving an MS in Health Physics can proceed toward the doctoral degree in Radiological Engineering or Medical Physics.

Visiting Faculty Financial Assistance
Arrangements for visiting faculty working on collaborative research and academic programs are arranged on an individual basis depending upon available funding.

Student Financial Assistance
Many types of financial assistance are available to full-time students enrolled in the Nuclear and Radiological Engineering Program. Qualifying graduate students in the College of Engineering may receive a University Graduate Scholarship (UGS) which covers tuition for the academic year and the summer quarters. University Graduate Assistantships (UGA) are also available which, in addition to tuition and fees, provides the student with a stipend during the regular academic year. Research Assistantships (RA) are often available for students to participate in externally-funded research which may serve as thesis or project research topics. Graduate awards supported by University funds are subject to specific guidelines and requirements. All students accepted for entrance into the graduate program can be considered for financial assistance. The Nuclear and Radiological Engineering Program also has some restricted fellowships which are limited to U. S. citizens. The faculty makes initial decisions on financial awards starting in February of each year. Academic excellence is the major criterion for these awards, but additional information submitted with the application is also considered.

Research Facilities
The Nuclear and Radiological Engineering Program at the University of Cincinnati has an elaborate arrangement of research and academic facilities, including laboratories for trace levels and actinide radiochemistry, a kilocurie ^{60}Co pool irradiator, a wide variety of laboratory and portable radiation detection instrumentation, alpha and gamma spectrometers, and sample preparation facilities. In addition, the Health Physics Program operates a state of the art *in vivo* measurement laboratory with two large shielded rooms containing multiple detector arrays for measuring internally deposited radioactive materials. The laboratory specializes in the design and fabrication of anthropometric calibration phantoms containing tissue substitutes for human muscle and bone. The program also has excellent computer facilities for performing mathematical simulations using Monte Carlo analysis, modeling, and computational analysis. The program recently added a Beowulf Cluster to its computational facilities. A Beowulf Cluster is a high-performance, scalable, and potentially massively parallel computer built from off-the-shelf components and running a freeware operating system like Linux. It consists of a cluster of PCs interconnected by a private high-speed network that can be dedicated to running high-performance computing tasks. The new UCNRE cluster includes 20 nodes each with a 2.6 GHz processor.

Sponsored Research Activities in Health Physics (2003 - Present)

MNCP-based Isotopic Characterization of PWR Spent Nuclear Fuel Assemblies
Principal Investigator: Ivan Maldonado **Agency:** Lawrence Livermore National Laboratory **Type:** Research Contract **Period:** 2005-2006 The objective of this research is to design a novel safeguards verification method and instrument that measures neutron and gamma signals in multiple locations inside a PWR SNF assembly in order to detect pin diversion(s) (i.e., fuel pins that have been removed and replaced with a "dummy" pin).

Development of Assumptions and Criteria for the High Flux Isotope Reactor
Principal Investigator: Ivan Maldonado **Type:** Research Contract **Agency:** UT-Batelle Oak Ridge National Laboratory **Period:** 2005 Investigation of Beryllium Internal Reflector Installation on the Fuel Cycle Length of the High Flux Isotope Reactor using 3D MCNP Model and Benchmarking of the HFIR Cycle-400.

BWR Assembly Optimization for Minor Actinide Recycling
Principal Investigator: Ivan Maldonado **Agency:** U. S. Department of Energy **Type:** US DOE NERI Grant **Period:** 2005 – 2007 This research is to apply and extend the latest advancements in the area of LWR fuel management optimization to the design of advanced boiling water reactor (BWR) fuel assemblies specifically for the recycling of minor actinides (MAs).

Curriculum Development and Training for Environmental Restoration and Waste Management.
Principal Investigator: Adrian Miron **Agency:** U. S. Department of Energy **Type:** Grant **Period:** 2005 – 2007 University of Cincinnati and Tuskegee University and Alabama A&M University will develop a two course sequence and a summer training program to educate and train students in the area of environmental restoration/waste management.

Experimental Investigation of Radio-Turbulence Induced Diffusion
Principal Investigator: Henry Spitz/Shoaib Usman **Agency:** U. S. Department of Energy **Type:** NEER Grant **Period:** 2002 – 2005 Measurement of the transport of radon in a fluid barrier to study turbulence associated with radioactive decay.

Analysis of Th-232 Excreted by Workers
Principal Investigator: **Samuel Glover Agency:** Industry **Type:** Contract **Period:** 2004 – 2007
Analysis of ultra low concentration of Th-232 in bioassay samples using neutron activation analysis.

Direct and Indirect Bioassay Measurements
Principal Investigator: Henry Spitz **Agency:** Industry **Type:** Contract **Period:** 1996 – 2006 Measurements and evaluation of occupational radiation exposure by direct in vivo measurement and analysis of biological media.

Collaborative Utility-University Project to Initiate a Comprehensive Program of Simulatory-Interfaced Instruction and Research
Principal Investigator: John Christenson **Agency:** U. S. Department of Energy, American Electric Power, First Energy Corporation **Type:** Grant **Period:** 1993 – 2007 Development of team-taught classes utilizing a combination of on-campus and simulator-site instruction and the initiation of plant-specific research projects.

Radiological Emergency Response Plant for National Institute for Occupational Safety & Health
Principal Investigator: Henry Spitz **Agency:** Centers for Disease Control **Type:** Contract **Period:** 2005 - 2006 Develop instrumentation needs and training for NIOSH radiological emergency responders.

Analysis of Radioactivity in Tree Cores from Radiologically Contaminated Sites
Principal Investigator: Henry Spitz/Samuel glover **Agency:** Industry **Type:** Pilot Study **Period:** 2005 - 2006 Analysis of uranium in samples of cores extracted from trees growing in radiologically contaminated sites.

Design and Fabrication of Human Tissue Surrogates and Anthropometric Calibration Standards
Principal Investigator: Henry Spitz **Agency:** Industry **Type:** Contract **Period:** 1996 – 2006 Design, fabrication and testing of anthropometric calibration standards for direct, in vivo measurement of radioactive materials and stable metals in humans.

19. UNIVERSITY OF FLORIDA

Department of Nuclear and Radiological Engineering
Telephone: (352) 392-1401 / Fax: (352) 392-3380
www.nre.ufl.edu

Program Director:

Wesley E. Bolch, PhD, PE, CHP
Department of Nuclear and Radiological Engineering
202 Nuclear Sciences Center
University of Florida Gainesville, Florida 32611
email: wbolch@ufl.edu

HP Degree Granted:

BS in Nuclear and Radiological Sciences (NRS)
MS and ME in Nuclear Engineering Sciences (Health Physics)
PhD in Nuclear Engineering Sciences (Health Physics)

Health Physics Faculty (≥25% FTE toward the HP program)

Samim Anghaie, Professor of Nuclear and Radiological Engineering, (352-392-1401 ext. 307); PhD Pennsylvania State University 1982; Reactor design, thermal hydraulics, nuclear materials, Monte Carlo simulation. [anghaie@ufl.edu]

James E. Baciak, Jr., Assistant Professor of Nuclear and Radiological Engineering, (352-392-1401 ext. 312); PhD University of Michigan 2004; Radiation measurements, room temperature gamma-ray spectroscopy, radiation instrumentation, scintillation detectors, compound semiconductor materials, national security - nuclear nonproliferation, active and passive interrogation, gas detectors. [jimmer@ufl.edu]

Wesley E. Bolch, PE, CHP, Professor of Nuclear and Radiological Engineering, (352-392-1401 ext. 308); PhD University of Florida 1988; External and internal radiation dosimetry, medical health physics, nuclear medicine dosimetry, microimaging of skeletal tissues for 3D skeletal dosimetry modeling, tomographic computational models for pediatric organ dosimetry, probabilistic internal dosimetry models for dose reconstruction efforts, microdosimetry, radiation effects to DNA. [wbolch@ufl.edu]

Edward T. Dugan, Associate Professor of Nuclear and Radiological Engineering (352-392-1401 ext. 309); PhD University of Florida 1976; Radiation transport, Monte Carlo analysis, reactor analysis and nuclear power plant dynamics and control, space nuclear power and propulsion, and radiographic imaging techniques applied to non-destructive examination. [edugan@ufl.edu]

David R. Gilland, Associate Professor of Nuclear and Radiological Engineering (352-392-1401 ext. 310); Ph.D. The University of North Carolina at Chapel Hill 1984; Medical imaging with emphasis on emission computed tomography, development of image acquisition and reconstruction methods, analysis of image quality applied to dynamic cardiac imaging and tumor imaging with high energy emitters. [gilland@ufl.edu]

Alireza Haghighat, Chair and Professor of Nuclear and Radiological Engineering (352-392-1401 ext. 306); PhD, University of Washington 1986; Particle transport methods and their applications, parallel computing, Monte Carlo methods, reactor physics, perturbation techniques, simulation of reactors and model devices. [haghighat@ufl.edu]

David E. Hintenlang, Associate Professor of Nuclear and Radiological Engineering (352-392-1401 ext. 311); PhD Brown University 1985, Clinical applications of radiation imaging and dosimetry, specifically for mammography and pediatric radiology. [dhinten@ufl.edu]

Glenn E. Sjoden, PE, Associate Professor of Nuclear and Radiological Engineering (352-392-1401 ext. 323); PhD The Pennsylvania State University 1987; Particle transport and numerical methods, nuclear systems analysis: medical, power generation, defense programs, NDT, and detection. Also convective heat transfer, computational fluids, and high performance computing applications. [sjoden@ufl.edu]

James S. Tulenko, Professor of Nuclear and Radiological Engineering (352-392-1401 ext. 314); MS Massachusetts Institute of Technology 1963; Nuclear fuel cycle, radioactive wastes, reactor analysis, engineering applications of radioisotopes, robotics, intelligent databases, systems analysis. [tulenko@ufl.edu]

William G. Vernetson, Associate Engineer, Director of Nuclear Facilities (352-392-1401 ext. 317); Ph.D. University of Florida 1979; Reactor safety, power and non-power reactor operations and training, systems design and probabilistic safety assessment, criticality analysis, neutron activation analysis. [vernet@ufl.edu]

Affiliate and Other Faculty

Manuel Arreola, Assistant Professor, Department of Radiology, Chief of Radiological Physics **Frank J. Bova**, Professor, Department of Neurosurgery **Libby Brateman**, Associate Professor, Department of Radiology **Jim Dempsey**, Assistant Professor, Department of Radiation Oncology **Kathleen Hintenlang**, Medical Physicist, Robert Boissoneaulp Oncology Institute, Ocala, Florida **Siyong Kim**, Assistant Professor, Department of Radiation Oncology **Travis Knight**, Adjunct Assistant Professor of Nuclear and Radiological Engineering **Chihray Liu,** Associate Professor, Department of Radiation Oncology **Jatinder R. Palta**, Professor, Department of Radiation Oncology, Chief of Therapy Physics **Lynn Rill,** Assistant Professor, Department of Radiology **Charlie Scheer**, Research Assistant, Department of Nuclear and Radiological Engineering **Dean Schoenfeld**, Research Assistant, Department of Nuclear and Radiological Engineering

Other Information

Students enrolled in the Health Physics Program within NRE may choose to concentrate their Master's studies in one of three areas: (1) power generation health physics, (2) radioactive waste management, or (3) medical health physics. The department also offers graduate degrees in nuclear engineering and medical physics (CAMPEP accredited).

Visiting Faculty Financial Assistance

The department occasionally hosts sabbatical leave for visiting faculty. Financial arrangements are negotiated on an individual basis.

Student Financial Assistance

Scholarships, fellowships, and assistantships are available through the Department, the College, and the University. The Department is an approved site for the DOE Nuclear Engineering and Health Physics Fellowships, and the INPO Health Physics Fellowship.

Research Facilities with the NRE Department

Advanced Laboratory for Radiation Dosimetry Studies (ALRADS) (Wesley Bolch, Director) Lateral Migration Radiography Research Laboratory (LMRRL) (Edward Dugan, Director) Particle Transport and Distributed Computing Laboratory (PTDCL) (Alireza Haghighat, Director) Radiation Detection and Development Laboratory (RDDL) (James Baciak, Director) Robotics Research Laboratory (RDL) (James Tulenko, Director) University of Florida Training Reactor (UFTR) (William Vernetson, Director)

Research Institutes Affiliated with the NRE Department

Innovative Nuclear Space Power and Propulsion Institute (INSPI) (Samim Anghaie, Director) Florida Institute for Nuclear Detection and Security (FINDS) (Alireza Haghighat, Director)

Professional Certification

The M.S. and Ph.D. programs in health physics prepare the student for Part I of the certification examination administered by the American Board of Health Physics. Eligibility of Part II of examination is based on professional experience.

Sponsored Research Activities in Health Physics (2003 – Present)

MicroCT-Based Skeletal Models for Use in Tomographic Voxel Phantoms for Radiological Protection

Principal Investigator: Wesley E. Bolch **Agency:** US DOE, Nuclear Engineering Education Research (NEER) Program **Type:** Research Grant **Period:** 2007 – 2009 The goal of this project is to develop paired-image radiation transport models of the adult skeleton, based on ex-vivo CT and microCT images from cadaveric skeletal tissues, for use in construction photon and neutron fluence-to-dose response functions. These functions will in turn be applied to whole-body voxel phantoms currently being developed by Committee 2 of the International Commission on Radiological Protection (ICRP) as a follow up to ICRP's 2007 recommendations.

Virtual Patients for Computing Radiation Dose

Principal Investigator: Wesley E. Bolch (Subcontract from RPI – George Xu, PI) **Agency:** National Cancer Institute (RO1 CA116743-01) **Type:** Research Grant RO1 **Period:** 2005 – 2008 The major goal of this project is to develop age-dependent series of 3D tomographic computational phantoms of pediatric patients for use in assessing internal organ dose received in CT, nuclear medicine, and radiation therapy.

Voxel Phantoms for Evaluation of Rapid Screening Methods of Contaminated Persons

Principal Investigator: Wesley E. Bolch (Subcontract to UF) **Agency:** TKC Integration Services, LLC / Radiation Studies Branch of CDC **Type:** Research Subcontract **Period:** 2006 – 2007 The overall goal of this research subcontract is to develop a computational description of the existing photon fluence (energy and angle) at the surface of the reference adult male and female as a function of time post-inhalation of various radionuclides of potential use in a radiological dispersal device. The data will subsequently be used to model detector responses for triage screening in large-scale mass contamination scenarios.

Advances in Skeletal Dosimetry through Microimaging

Principal Investigator: Wesley E. Bolch **Co-Investigators:** Scott Myers, MD, Phillip Patton (UNLV), Derek Jokisch (FMU), George Sgouros (JHU) **Agency:** National Cancer Institute (RO1 CA96441-01A1) **Type:** Bioengineering Research Grant RO1 **Period:** 2003 – 2007 The specific aims of this research grant are to (1) construct a detailed and comprehensive reference skeletal model for the adult male and female using in-vivo CT, ex-vivo CT, and microimaging (NMR or microCT) of sectioned samples of spongiosa, and (2) develop algorithms and data schemes necessary to scale radionuclide S values from these reference individuals to specific radionuclide therapy patients.

Comprehensive Modeling of SNM Detection Using 3-D Deterministic and Monte Carlo Methods

Principal Investigator: Glenn Sjoden, PI **Agency:** National Nuclear Security Administration (NNSA) **Type:** Research Contract **Period:** 2004 – 2007

Single Crystal Bismuth Iodide Gamma-Ray Spectrometers
Principal Investigator: James Baciak, PI **Agency:** Defense Threat Reduction Agency (DTRA)
Type: Research Contract **Period:** 2003 – 2007

Advances in Skeletal Dosimetry through Microimaging - Supplement
Principal Investigator: Wesley E. Bolch, **Postdoctoral Research Associate**: Vincent Bourke **Agency:** National Cancer Institute (NCI), Post-Doctoral Fellowship for Handicapped Individuals **Type:** Research Supplement (RO1 CA06441) **Period:** 2005 – 2007 This grant supplement supported the post-doctoral research of Dr. Vince Bourke. The overall goal of this research was to determine the 3D spatial gradient of both hematopoietic stem and progenitor cells within the marrow cavities of human cancellous bone through immunohistochemical staining and digital image processing of large section bone specimens acquired at autopsy. The work is an extension of previous studies mapping CD34+ cells in human marrow, and extends that analysis to include CD117+ cells.

National Research Service Award
Principal Investigator: Wesley E. Bolch **Graduate Student Supported:** James Brindle **Agency:** National Cancer Institute (NCI), Pre-Doctoral Fellowship for Minorities **Type:** Research Grant (F31 CA97522-01), **Period:** 2002 – 2006 This grant supports the doctoral studies of Mr. James Brindle at the University of Florida. Mr. Brindle's dissertation research supports NCI grant RO1 CA96441.

Synthetically Enhanced Detector Resolution Algorithm (SEDRA)
Principal Investigator: Glenn Sjoden, PI **Agency:** Department of Homeland Security **Type:** Research Contract **Period:** 2005 – 2006

Feasibility Study of Gamma Spectroscopy to Identify Materials in Closed Containers
Principal Investigator: Glenn Sjoden, PI **Agency:** Southern Nuclear Company **Type:** Research Contract **Period:** 2006

Measurement-to-Activity Conversion Coefficients for Medical Emergency Response
Principal Investigator: Wesley E. Bolch (Subcontract to UF) **Agency:** Sanford Cohen & Associates, Inc. (#ACDS-S-01) / Radiation Studies Branch of CDC **Type:** Research Subcontract **Period:** 2004 – 2006 The overall goal of this research subcontract was to use Monte Carlo radiation transport techniques with stylized adult anthropomorphic phantoms to assess detector responses per unit lung and whole-body activity burdens for various radionuclides of potential use in a radiological dispersal device. Detectors considered were a NaI survey meter, thyroid probe, portal monitor, and a nuclear medicine gamma camera.

An Image-Based Computational System for Radionuclide Therapies of Skeletal Tumors
Principal Investigator: Wesley E. Bolch **Co-Investigators:** James Turner (ORNL) **Agency:** US DOE, Nuclear Engineering Education Research (NEER) Program **Type:** Research Grant (DE-FG07-02ID14327) **Period:** 2002 – 2005 The goal of this project is to develop 3D digital models of skeletal metastases in breast and prostate cancer patients. These models are then coupled to radiation transport codes permitting evaluations for optimal radionuclide selection and radiopharmaceutical localization in radionuclide therapies. The models are developed from fusion of NMR microscopy and microCT images of normal trabecular bone and serial images of skeletal tumor biopsy samples. Specific emphasis is placed on alpha-particle emitters.

Assessment of Airborne Particulate Lung Solubility and Internal Dose to Phosphate Workers
Principal Investigator: Wesley E. Bolch **Co-Investigators:** CY Wu and Ray Guilmette (ORNL) **Agency:** Florida Institute for Phosphate Research **Type:** Research Grant (FIPR #03-05-064) **Period:** 2003 – 2004 The goals of this research grant are to determine particle solubility within simulated lung fluids for improved modeling of worker doses resulting from inhalation exposures in the Florida phosphate industry.

A Critical Evaluation of Patient Doses in Screening Mammography
Principal Investigator: David E. Hintenlang **Agency:** US DOE, Nuclear Engineering Education Research (NEER) Program **Type:** Research Grant **Period:** 2002 - 2004 The project will integrate empirical measurements on a series of dosimetry and imaging phantoms with Monte Carlo calculations to correlate the dose profile and mean glandular dose with exposure measurements. Combined with survey of mammographic facilities, the resultant information can be used to better compare the benefits of new imaging techniques such as digital mammography, provide realistic dosimetry for retrospective epidemiological studies, and ultimately a more accurate evaluation of the risk vs. benefit to the screening population.

Feasibility for Optimizing Pediatric CT Using Objective Measures of Doses and Image Quality
Principal Investigator: David E. Hintenlang **Agency:** The Society for Pediatric Radiology **Type:** Research Grant **Period:** 2002 - 2003 It is hypothesized that empirical measurements of pediatric CT doses can be integrated with concurrent, objective measures of CT image quality to develop a methodology for optimizing pediatric CT examination protocols.

Assessment of Airborne Particulate Lung Solubility and Internal Dose to Phosphate Workers
Principal Investigator: Wesley E. Bolch **Agency:** Florida Institute for Phosphate Research **Type:** Research Grant (FIPR #03-05-064) **Period:** 2003 – 2005 The goals of this research grant are to quantify the in-vivo lung fluid solubility of inhaled naturally occurring radioactive aerosols within the Florida phosphate industry. An in-vitro dissolution test system is used to simulate the lung fluid environment for air particle samples acquired via a 7-stage cascade impactor sampling system. Lung and effective doses to phosphate industry workers are assessed via the LUDEP and IMBA internal dosimetry codes.

Risk Assessment of Airborne Particulates to Workers in the Phosphate Industry
Principal Investigator: Wesley E. Bolch **Co-Investigators:** Emmett Bolch and CY Wu **Agency:** Florida Institute for Phosphate Research **Type:** Research Grant (FIPR #00-05-062R) **Period:** 2001 – 2003 The goals of this research grant are to quantify the airborne radioactivity hazard to workers in the phosphate industry. Specific tasks include (1) particle size sampling via 2-stage dichotomous and 7-stage cascade impactor sampling, (2) radioactivity analysis via gamma spectroscopy, and (3) analysis of particle shape and chemical composition via scanning electron microscopy and characteristic x-ray spectroscopy. Dose assessments are made using the ICRP 66 human respiratory tract model for particle deposition, clearance, and tissue dose.

Radiation Damage to DNA: Impact of Variations in the Molecular Microenvironment
Principal Investigator: David T. Marshall, MD, **Co-Investigator:** Wesley E. Bolch **Agency:** The Whitaker Foundation (subcontract to UMDNJ) **Type:** Research Grant (RG-00-0488) **Period:** 2001 – 2004 The goals of this research grant are to develop computational models of both direct and indirect damage to DNA by explicitly modeling atom-specific damage through direct ionization or indirect free radical attack. Model testing is accomplished through photon irradiation of linear segments of double-stranded DNA or of plasmids. Damage assessment is performed through capillary electrophoresis. Damage is quantified with respect to changes in dissolved oxygen concentration of the DNA solution.

Tomographic Dosimetry Phantoms for Pediatric Radiology
Principal Investigator: Wesley E. Bolch **Co-Investigators:** David E. Hintenlang, Manuel M. Arreola, and Jon L. Williams, MD **Agency:** National Institutes for Health, NICHD (RO1 HD38932-01/02) and NIBIB (RO1 EB00267-03) **Type:** Bioengineering Research Grant RO1 **Period:** 2000 – 2004 The goal of this research grant is to develop anatomic models of the newborn patient for use in computational modeling of radiation doses received during pediatric fluoroscopic and CT examinations. Companion experimental studies involve the development of tomographic physical phantoms and the use of MOSFET dosimeters to assess internal organ doses in real time.

A Probabilistic Dosimetry Model for Radionuclide DCFs
Principal Investigator: W. Emmett Bolch **Co- Investigator:** Wesley E. Bolch **Agency:** Centers for Disease Control and Prevention **Type:** Research Grant (R32/CCR416743) **Period:** 1999 – 2003 This grant involves the development of internal dosimetry computational models for radionuclide ingestion, inhalation, and translocation in the body which utilize Latin hypercube sampling of input parameters based upon their probability density functions. The end products are distributions and percentile rankings of organ doses per unit intake of radionuclide. These models will thus permit tailored dose estimates and their uncertainties in DOE complex and nuclear weapons program dose reconstruction activities.

20. UNIVERSITY OF MASSACHUSETTS LOWELL

Physics Department/Radiological Sciences Program
Telephone: (978) 934-3286 / Fax: (978) 934-1054

Program Director and Contact Information:

Dr. Clayton S. French
Radiological Sciences Program
University of Massachusetts Lowell
1 University Avenue
Lowell, Massachusetts 01854
Clayton_French@uml.edu

Types of HP Degrees Granted:

B.S. in Physics /Radiological Health Physics Option
M.S. in Radiological Sciences and Protection – Thesis, Project, or Professional Science Master options
Ph.D. in Physics/Radiological Sciences Option
Ph.D. in Biomedical Engineering and Biotechnology - Medical Physics/Radiological Sciences Option

Enrollment and Graduates by Degree Type

BS HP Enrollment (Spring 2010): 8
MS HP Enrollment (Spring 2010): 28
PhD HP Enrollment (Spring 2010): 19

BS HP Graduates (2009-10 academic year): 2
MS HP Graduates (2009-10 academic year): 10
PhD HP Graduates (2009-10 academic year): 1

BS HP Graduates (2008-09 academic year): 2
MS HP Graduates (2008-09 academic year): 13
PhD HP Graduates (2008-09 academic year): 1

Remote Delivery of Course: None

Health Physics Faculty (≥25% FTE toward the HP program)

Clayton S. French, CHP, Professor of Radiological Sciences (978-934-3286); Ph.D. University of Lowell 1985; Health physics, mathematical modeling and internal dosimetry, radon, fallout, computer applications.
Clayton_French@uml.edu

Erno Sajo, Professor of Physics – Medical Physics and Radiological Sciences (978-934-3288); Adjunct Professor of Physics, Louisiana State University. Ph.D. University of Lowell, 1990; Radiation Transport with applications in Medical Physics, Radiation Biology, and Aerosol Transport.
Erno_Sajo@uml.edu

Mark A. Tries, Associate Professor of Radiological Sciences (978-934-3353); Ph.D. University of Massachusetts Lowell 2000; Health physics, external dosimetry, nuclear instrumentation, radiochemistry. Mark_Tries@uml.edu

David C. Medich, Adjunct Professor of Radiological Sciences and Director of Radiation Safety (978-934-3372); Ph.D. University of Massachusetts Lowell 1997; Health physics, accelerator physics, radiation biology, nuclear instrumentation, radiation dosimetry simulation, medical physics.
David_Medich@uml.edu

Other Faculty Contributing to the Health Physics Program

James Egan, Professor of Physics, Nuclear Physics Program.
Art Mittler, Professor of Physics, Nuclear Physics Program.
Walter Schier, Professor of Physics, Nuclear Physics Program.
Gunter H. R. Kegel, Professor of Physics, Nuclear Physics Program.

Research Facilities
UMass Lowell has a 1-MW Research Reactor, 5-MW Van De Graaff Accelerator, radiochemistry and radiobiology laboratories, nuclear instrumentation laboratory, environmental radioactivity measurement laboratories, operational health physics laboratory, dosimetry laboratory, Aerosol laboratory X-ray facility, and computational facilities dedicated to the Radiological Sciences Program. Off-campus research venues are available at nearby hospitals, radiopharmaceutical production facility, power reactor utility companies, universities, and engineering companies.

Sponsored Research Activities in Health Physics

Nuclear Experiential Education and Training Program at the University of Massachusetts Lowell
Principal Investigator: Mark Tries
Agency: Nuclear Regulatory Commission
Type: Education
Period: August 31, 2007 to August 31, 2009
The goal of this grant was to create two courses (Nuclear Reactor Operator Training and Reactor Health Physics) that would familiarize students with UML Research Reactor operations.

Computational Aerosol Transport
Principal Investigator: Erno Sajo
Agency: Department of Defense
Type: Research
Period: September 2008 – April 2010

The project aids the design and prototyping of reactive military airlocks.

Brachytherapy Delivery System for Treatment of Lung Cancer
Principal Investigator: David Medich
Agency: NIH/NCI
Type: Research
Period: September 1, 2008 to August 31, 2010
The goal of this investigation is to develop brachytherapy “staples” for conformal radiation treatment of non-small cell lung cancer and to characterize the dosimetric output of these staples.

Other Information
All of the academic programs are strongly based in the physical and biological sciences. A five-year BS/MS degree option is available. Graduate students can receive support under DOE, NANT, NRC, and industry-based research fellowships. A limited number of teaching assistantships are available to qualified students. UMass Lowell offers a wide variety of financial assistance including scholarships, fellowships, student teaching assistantships, student research assistantships, and work study programs. All students are given opportunities for gaining applied work experience through internships at the UML Nuclear Center, hospitals, nuclear power stations, and other participating organizations. Students in Radiological Sciences are encouraged to obtain ABHP certification. In addition to offering an elective graduate course in Certification Exam Preparation, M.S. degree candidates can opt to take Part I of the ABHP as an alternative to the comprehensive examination required for students who choose to complete a 3-credit research project rather than a 9-credit thesis.

21. UNIVERSITY OF MICHIGAN

Department of Nuclear Engineering & Radiological Sciences Telephone: (734) 764-4260 / Fax: (734) 763-4540

Program Director:
Professor Kim Kearfott
University of Michigan Department of Nuclear Engineering & Radiological Sciences
2355 Bonisteel Blvd., Rm. 1906 Cooley Bldg.
Ann Arbor, Michigan 48109-2104

(734) 763-9117 Email: kearfott@umich.edu
www.ners.engin.umich.edu Admissions: Peggy Jo Gramer /
Email: pjgramer@umich.edu

HP Degrees Granted:
B.S.E. in Nuclear Engineering and Radiological Sciences
M.S.E. or M.S. in Nuclear Engineering & Radiological Sciences
Ph.D. in Nuclear Engineering & Radiological Sciences
Ph.D. in Nuclear Science

Remote Delivery of Course: None.

Health Physics Faculty (≥25% FTE toward the HP program)

Kimberlee J. Kearfott, CHP, Professor of Nuclear Engineering & Radiological Sciences (734-763-9117); Sc.D Massachusetts Institute of Technology 1980; Radiation imaging, radiation detection, internal and external radiation dosimetry, radon gas detection and mitigation, applied health physics medical physics imaging, medical health physics. [kearfott@engin.umich.edu]

Alex Bielajew, Professor of Nuclear Engineering and Radiological Sciences (734-764-6364); Ph.D. Stanford 1982; Analytic and numerical methods for electron and photon transport processes and their application in radiation dosimetry and radiotherapy cancer treatment. [bielajew@engin.umich.edu]

Mitchell Goodsitt, Adjunct Professor of Nuclear Engineering & Radiological Sciences (734-764-4260); Ph.D University of Wisconsin 1982; Reviewer of Medical Physics, Radiology, Academic Radiology, Radiographs, and IEEE Transactions on Information Technology in Biomedicine; AAPM Task Force Group: Image Intensifier.

Zhong He, Associate Professor of Nuclear Engineering and Radiological Sciences (734-764-7130); Ph.D. Southampton 1993; Radiation detection, radiation imaging. [hezhong@engin.umich.edu].

James P. Holloway, Professor of Nuclear Engineering & Radiological Sciences (734-936-3126); Ph.D. University of Virginia 1989; Mathematical modeling and analysis, numerical methods, radiation transport and shielding, nuclear reactor physics. [hagar@engin.umich.edu]

David K. Wehe, Associate Professor of Nuclear Engineering and Radiological Sciences; Director, Michigan Memorial Phoenix Project (734-763-115); Ph.D. University of Michigan 1984; Radiation detection, radiation imaging. [dkw@engin.umich.edu]

Supporting Faculty

A. Ziya Akcasu, Professor Emeritus of Nuclear Engineering **Michael Atzmon**, Associate Professor in Nuclear Engineering and Radiological Sciences **James J. Duderstadt**, Professor in Nuclear Engineering and University Professor Science and Engineering **Rodney C. Ewing,** Professor in Nuclear Engineering and Radiological Sciences **John E. Foster,** Associate Professor in Nuclear Engineering and Radiological Sciences **Ronald F. Fleming**, Professor of Nuclear Engineering and Radiological Sciences **Ronald M. Gilgenbach**, Professor in Nuclear Engineering and Radiological Sciences **Mark Hammig,** Assistant Research Scientist in Nuclear Engineering and Radiological Sciences **Michael Hartman**, Assistant Professor in Nuclear Engineering and Radiological Sciences **James P. Holloway,** Professor in Nuclear Engineering and Radiological Sciences **Terry Kammash**, Stephen S. Attwood Professor Emeritus in Nuclear Engineering and Radiological Sciences **Karl Krushelnick,** Professor in Nuclear Engineering and Radiological Sciences **Glenn F. Knoll**, Professor Emeritus in Nuclear Engineering and Radiological Sciences **Edward W. Larsen**, Professor in Nuclear Engineering and Radiological Sciences

Y. Y. Lau, Professor in Nuclear Engineering and Radiological Sciences **John C. Lee**, Professor in Nuclear Engineering and Radiological Sciences **William R. Martin**, Professor and Chair of the Department of Nuclear Engineering and Radiological Sciences **Sebastien Teysseyre,** Research Investigator in Nuclear Engineering and Radiological Sciences **Lumin Wang,** Professor in Nuclear Engineering and Radiological Sciences **Gary S. Was**, Professor in Nuclear Engineering and Radiological Sciences **Fang Zeng,** Assistant Research Scientist in Nuclear Engineering and Radiological Sciences

Adjunct Faculty **Jeremy Busby,** Adjunct Assistant Professor in Nuclear Engineering and Radiological Sciences **Frederick W. Buckman,** Adjunct Professor in Nuclear Engineering and Radiological Sciences **Michael J. Flynn**, Adjunct Professor in Nuclear Engineering; Bioscience Professor Henry Ford Health System **Mitchell Goodsitt,** Adjunct Professor in Nuclear Engineering, Professor Environmental Health Sciences, Professor Radiology Department **Russell Stoller**, Adjunct Associate Professor, Chemical Engineering **Randall Ten Haken**, Adjunct Professor in Nuclear Physics, Professor in Radiation Oncology **Ruth Weiner,** Adjunct Professor in Nuclear Engineering and Radiological Sciences

Sponsored Research Activities in Health Physics (2003 – Present)

Applied Environmental Radiation Measurements Laboratory

Principal Investigator: Kimberlee Kearfott **Agency:** National Science Foundation with U-M Elizabeth Caroline Crosby Research Award **Type:** Research Grant **Period:** 2006 - 2007 A new facility has been established which focuses on the measurement of small amounts of radiation in the environment and in laboratory samples. Unique, practical capabilities to solve actual industrial, medical, nuclear power, and national laboratory radiation safety challenges are to be developed through applied research. A variety of specific projects, relating to nuclear facility decommissioning, nuclear power plant emissions verification, geological research, radiotracer experiments, responses to radiological terrorists events, and the clean-up of contaminated environments are possible. Capabilities include alpha spectroscopy, portable and laboratory gamma and X-ray spectroscopy with HPGe and NaI, integrative and temporal radon and radon progeny measurement, and thermoluminescent dosimetry.

Radioactive Materials Risk Transportation
Principal Investigator: Kimberlee Kearfott **Agency:** Sandia National Laboratories **Type:** Research Grant **Period:** 2006 - 2007 This work involves the analytical and experimental study of the radiation exposures that result from the compromise in the lead liner of a high level waste (nuclear fuel) shipping cask. Analytical models based upon point spread functions are to be developed for incorporation into the risk analysis code RADTRAN. Verification of this equation is to be accomplished using MCNP as well as a down-scaled experimental model.

NERS 585 Laboratory Development
Principal Investigator: Kimberlee Kearfott **Agency:** U-M Department of NERS and College of Engineering **Type:** Research Grant **Period:** 2006 - 2007 A new laboratory is being developed for applied radiation measurements, featuring practical laboratory exercises of relevance to radiation safety, environmental sciences, and medical physics. The laboratory will also feature a combination of physical measurements with computational simulations.

Radiation Dosimeter Development
Principal Investigator: Kimberlee Kearfott **Agency:** PreSense, LLC **Type:** Research Grant **Period:** 2006 - 2007 Illicit nuclear materials for atomic or nuclear weapons or for use in radiological dispersive devises (dirty bombs) have become of great national interest since September 11. This research project has as its goals the investigative of optically stimulated and thermally stimulated materials for use to detect such materials through the integration and read-out of signals in unique ways. New materials with specific temporal properties are also being investigated.

Detection of Concealed Conventional Bulk Explosives
Principal Investigator: Kimberlee Kearfott **Agency:** nPoint, LLC **Type:** Research Grant **Period:** 2006 - 2007 Several different neutron-based methods for detecting explosives are possible, all based upon detection of the excess nitrogen found in explosives. This project has as its goals the investigation of several new approaches, as well as the combination of existing approaches for improved sensitivity and specificity. The grant focuses upon the development of an experimental facility for studying these approaches.

Explosives Detection Using Neutrons
Principal Investigator: Kimberlee Kearfott **Agency:** U.S. Dept. of Army, TACOM **Type:** Research Grant **Period:** 2006 - 2007 Simulations are to be performed to fully characterize the interrogation of objects and the environment for the detection of explosives. The simulations should lead to an understanding of the best approach for the detection of explosives. The problems of land mines, improvised explosive devices, car bombs, and large amounts of explosives held in shipping containers are to be addressed separately.

Applied Environmental Radiation Measurements Laboratory
Principal Investigator: Kimberlee Kearfott **Agency:** University of Michigan **Type:** Research Grant **Period:** 2002 - 2005 This internal grant provided funds for the purchase of equipment necessary to perform alpha and gamma ray spectroscopic analysis for environmental (low activity) samples. The funds substantially supplemented the capability for health physics research and teaching at this institution. A new advanced laboratory course is being considered while substantial opportunities have been opened for undergraduate research as a result of obtaining this equipment.

Radionuclides: Radiation Detection and Quantification
Principal Investigator: David Wehe **Agency:** National Institutes of Health (subcontract) **Type:** Research Grant **Period:** 2002-2005 This long-term project focuses on the development of compact mechanical and electronic gamma-ray imagers for environmental measurements. Over the years, a series of cameras of increasing sophistication has been built, with the current generation using a combination of mechanical and electronic collimation. The goal is to develop compact gamma ray imagers that can operate in a wide range of gamma-ray fields and energies, and produce locations of hot spots and their isotopic sources.

High Purity Germanium Detectors
Principal Investigator: Kimberlee Kearfott **Agency:** Bechtel Handford **Type:** Equipment Grant **Period:** 2002 - 2005 This was a significant equipment donation of HPGe detectors to be used for research which has as its goals the improved in situ determination of the types and concentrations of radionuclides on contaminated Department of Energy sites.

Single Polarity Charge Sensing HgI2 Gamma-Ray Detectors
Principal Investigator: Zhong He **Agency:** Constellation Technology Corporation **Type:** Research Grant **Period:** 2003 - 2005 Having a high atomic number, high density and wide band gap, HgI2 is very attractive as high efficiency semiconductor gamma-ray detector that can be operated at room temperatures. However, due to the poor carrier transport properties, the induced charge on a conventional planar electrode is not directly proportional to the gamma-ray energy deposited in detector volume, but rather is a function of the interaction depth between the cathode and the anode.

Transportation Risk Analysis
Principal Investigator: Kimberlee Kearfott **Agency:** US Department of Energy **Type:** Research Grant **Period:** 2003 - 2004 The goals are this project are to analyze models in current DOE transportation risk analysis codes for nuclear accidents and terrorist incidents

Fast Neutron Imaging Spectrometers
Principal Investigator: Zhong He **Agency**: U.S. Department of Energy/NEER Grant **Type**: Research Grant **Period:** 2002 - 2004 The remote sensing of nuclear materials is important for DOE programs in national security and international arms control, especially after the tragic events of September 11. The detection of fast neutrons is important in these applications. The sensitivity of such measurements can be greatly enhanced if information is also gained on the direction of the incoming radiation. Systems for the imaging of gamma ray sources are under development at a number of laboratories. We are interested in extending this imaging capability to fast neutron measurements. The goal of this project is to develop a fast neutron spectrometer design that is capable of localizing the incident direction of each detected neutron without the use of collimation. The principle is based on a parallel approach to Compton scatter imaging for gamma rays. The effective detection efficiency of such a system can be orders of magnitude higher than that for a collimated system, and the large mass and imperfect angular selection of a fast neutron collimator are avoided. The approach can also provide an unambiguous measurement of the incident neutron energy that may be exploited to differentiate between various possible sources of neutrons.

Pixellated Detector Development
Principal Investigator: Zhong He **Agency:** Department of Defense, Defense Threat Reduction Agency **Type:** Research Grant **Period:** 2003 - 2004 This project will develop 3-dimensional position-sensitive CdZnTe and HgI2 gamma-ray spectrometers which could offer energy resolutions of 1% or better FWHM at 662 keV gamma-ray energy, for nuclear nonproliferation and homeland security applications.

Advanced Radiation Dosimeters for Radiological Dose Assessments
Principal Investigator: Kimberlee Kearfott **Agency:** Los Alamos National Laboratory, NMT-5, C-SIC **Type:** Research Grant **Period:** 2002 - 2003 The goal of this grant was to develop concepts for novel radiation dosimeters capable of determining radiation dose as a function of time for personnel working in a variety of different radiation fields. Implementation and testing of these concepts remains to be funded. The availability of a non-electronic dosimeter provided temporal dose information following exposures is of benefit for the investigation of unusual personnel exposures as well as for several homeland security applications.

Miniature Neutron-Alpha Activation Spectrometer
Principal Investigator: Zhong He **Agency**: National Aeronautics and Space Administration **Type**: Research Grant **Period:** 2002 - 2003 The purpose of this project is to develop a miniature (under 1 kg) instrument to be used on a lander or Rover type vehicle to Mars. The instrument will provide in situ whole-sample composition covering a wide range of elements in the periodic table, including the identification of elements present in water and biological materials. The Miniature Neutron-Alpha Activation Spectrometer (MiNAAS) will extend the range and penetration depth of current Rutherford backscattering spectrometers by incorporating neutron activation techniques in order to enable whole-rock determination of chemical species. MiNAAS will use neutron bombardment and detection of the resultant gamma emissions to complement and augment the composition information achieved with an alpha-based spectrometer.

High Pressure Xenon Gamma Ray Spectrometers for Field Use
Principal Investigator: Zhong He **Agency:** U.S. Department of Energy/Nuclear Engineering Education Research (NEER) **Type:** Research Grant **Period:** 1999-2003 There is a need for portable gamma ray spectrometers with good detection efficiency and energy resolution that do not require the cryogenic cooling needed for germanium detectors. We are investigating the use of high pressure (50 atm) xenon-filled ion chambers for this purpose. Our unique approach involves the incorporation of a coplanar grid anode into the design to eliminate the Frisch grid that has been required in previous designs.

Horizontal Ampoule Growth and Characterization of Mercuric Iodide at Controlled Gas Pressures for X-Ray and Gamma Ray Spectrometers
Principal Investigator: John Lee, Douglas McGregor **Agency:** U.S. Department of Energy/Nuclear Engineering Education Research (NEER) **Type:** Research Grant **Period:** 2000 - 2004 The project involves the investigation of various gas, pressure and thermal environments on the quality of mercuric iodide crystals for X-ray and gamma ray spectroscopy. Mercuric iodide (HgI2) is wide band gap semiconductor composed of heavy elements. As a result, HgI2 is a primary candidate for room-temperatureoperated, compact, high-resolution, and high-efficiency solid state gamma-ray detectors. Most HgI2 crystals are grown using a variation of the vertical ampoule oscillating heater method, which is very slow and yields only one crystal per ampoule. The horizontal growth method allows for multiple crystals to be grown in a single ampoule in half of the time required for the vertical growth method.

Evaluation of Display Technology for Medical Applications
Principal Investigator: John Lee, Mike Flynn **Agency:** U.S. Department of Energy/Nuclear Engineering Education Research (NEER) **Type:** Research Grant **Period:** 2001 - 2003

Advanced Radiation Detector Development in Support of National Security Needs
Principal Investigator: David Wehe **Agency:** U.S. Department of Energy/NN **Type:** Research Grant **Period:** 2001-2004 The goal of this research project is to develop compact radiation detectors which can be useful in non proliferation applications. The project supports exciting research in room temperature detectors using semiconductors such as CZT. One of the more unusual detectors being developed involves tiny cantilever beams which deflect when radiation interacts in them. Much like a diving board, the beams vibrate at a natural frequency from the impact and the amplitude is dependent upon the momentum absorbed.

Gamma Ray Imaging for Environmental Management Applications
Principal Investigator: David Wehe **Agency:** U.S. Department of Energy **Type:** Research Grant **Period:** 1986 - 2003 This long-term project focuses on the development of compact mechanical and electronic gamma-ray imagers for environmental measurements. Over the years, a series of cameras of increasing sophistication has been built, with the current generation using a combination of mechanical and electronic collimation. The goal is to develop compact gamma ray imagers that can operate in a wide range of gamma-ray fields and energies, and produce locations of hot spots and their isotopic sources.

Collaborative Research on X-ray Imaging
Principal Investigator: David Wehe, Mike Flynn **Agency:** Henry Ford Hospital **Type:** Research Grant **Period:** 1998-2003 This long-term project focuses on the development of compact mechanical and electronic gamma-ray imagers for environmental measurements. Over the years, a series of cameras of increasing sophistication has been built, with the current generation using a combination of mechanical and electronic collimation. The goal is to develop compact gamma ray imagers that can operate in a wide range of gamma-ray fields and energies, and produce locations of hot spots and their isotopic sources.

Monte Carlo (Radiation) Treatment Planning
Principal Investigator: Alex Bielajew **Agency:** ADAC/Geometrics **Type:** Research Grant **Period:** 1999-2003 This project will work on the development of 3-D Monte Carlo-based calculation software in a rectilinear geometry relevant to the problem of radiotherapy dose-planning; analysis tools for use of Monte Carlo calculated dose volume histograms; and deconvolution techniques to estimate converged Monte Carlo results. The object of this work is to develop fast Monte Carlo methods intended to be sufficiently accurate and fast for routine use in hospitals for the purpose of radiotherapeutic dose planning. This new code is called DPM, for Dose Planning Method.

Corrosion of Spent Nuclear Fuel: The Long-Term Assessment
Principal Investigator: Rodney Ewing **Agency:** U.S. Department of Energy, Environmental Management Science Program **Type:** Research Grant **Period:** 1997-2003 In this research program we address the following issues: What are the long-term corrosion products of natural UO2+x, uraninite, under oxidizing and reducing conditions? What is the paragenesis or the reaction path for the phases that form during alteration? How is the sequence of formation related to the structure of these uranium phases and reacting ground water composition? What is the trace element content in the corrosion products as compared with the original UO2+x? Do the trace element contents substantiate models developed to predict radionuclide incorporation into the secondary phases? Are the corrosion products accurately predicted from geochemical codes (e.g., EQ3/6) that are used in performance assessments? How persistent over time are the metastable phase assemblages that form? Will these phases serve as effective barriers to radionuclide release? Experimental results and theoretical models for the corrosion of spent nuclear fuel under oxidizing and reducing conditions have been tested by comparison to results from studies of samples from the Oklo natural fission reactors.

Inert-Matrix Fuels: Actinide "Burning" and Direct Disposal
Principal Investigator: Rodney Ewing **Agency:** U.S. Department of Energy, Environmental Management Science Program **Type:** Research Grant **Period:** 1999-2003 Excess actinides result from the dismantlement of nuclear weapons (^{239}Pu) and the reprocessing of commercial spent nuclear fuel (mainly ^{241}Am, ^{244}Cm and ^{237}Np). In Europe, Canada and Japan studies have determined much improved efficiencies for burn-up of actinides using inert-matrix fuels. This innovative approach also considers the properties of the inert-matrix fuel as a nuclear waste form for direct disposal after one-cycle of burn-up. Direct disposal can considerably reduce cost, processing requirements, and radiation exposure to workers. Under this program, we study the fuel and waste form properties of the most promising inert-matrix fuels, i.e. cubic zirconia and zirconia/spinel composites.

Radiation Effects in Nuclear Waste Materials
Principal Investigator: Lumin Wang **Agency:** U.S. Department of Energy, Environmental Management Science Program **Type:** Research Grant **Period:** 2001-2003 The objective of this research program is to achieve better understanding on radiation effects in candidate materials for nuclear waste disposal, including both glass and ceramic waste forms. Microstructural and microchemical evolution of the target material under either ionizing or blastic irradiation is investigated with transmission electron microscopy at near atomic resolution.

Radiation Effects on Sorption and Mobilization of Radionuclides through the Geosphere
Principal Investigator: Lumin Wang **Agency:** U.S. Department of Energy, Environmental Management Science Program **Type:** Research Grant **Period:** 1997-2003 This project is the continuation of our previous research project on radiation effects in materials at the near-field of a nuclear waste repository sponsored by the Environmental Management Science Program during the last three years. The objective of this research program is to evaluate the long term radiation effects on the sorption and mobilization of radionuclides through geosphere with accelerated experiments in the laboratory using energetic particles (electrons, ions and neutrons). We are particularly interested on how radiation may affect the sorption/desorption capacity of certain porous or layer-structured materials for radionuclides.

22. UNIVERSITY OF MISSOURI-COLUMBIA

Nuclear Science and Engineering Institute
Telephone: (573) 882-8201 / Fax: (573) 884-4801
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Program Contact:
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E2433 Lafferre Hall
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HP Degrees Granted:
Undergraduate Minor in Nuclear Engineering (with Health Physics Option)
M.S. in Nuclear Engineering (with Health Physics Option)
Ph.D. in Nuclear Engineering (with Health Physics Option)

Remote Delivery of Course: Partial MS and PhD curricula

Enrollment and Graduates by Degree Type
MS HP Enrollment (Spring 2010): 3
PhD HP Enrollment (Spring 2010): 1
MS HP Graduates (2009-10 academic year): 2

Health Physics Faculty (≥25% FTE toward the HP program)

Tushar Ghosh, Director of Graduate Studies and Professor of Nuclear Engineering (573-882-9736); Ph.D. Oklahoma State University 1989; Mass transfer in absorption processes-experimental and theoretical investigation, absorption phenomena (particularly radon) in biological systems, kinetics and reaction mechanisms of catalytic reactions, activation of coals, indoor air quality. [ghosht@missouri.edu]

Sudarshan K. Loyalka, PE, Curators' Professor, Professor of Nuclear Engineering and Director of Particulate Systems Research Center (573-882-3568); Ph.D. Stanford University 1967; Kinetic theory of gases, neutron transport, mechanics of aerosols including radon progeny, physics and thermal hydraulics of nuclear reactors, reactor safety analysis. [loyalkas@missouri.edu]

William H. Miller, CHP, PE, Professor of Nuclear Engineering (573-882-9692); Ph.D. University of Missouri 1976; Radiation detection and instrumentation, health physics applications, dosimetry. [millerw@missouri.edu]

Mark A. Prelas, PE, Director of Research**,** Professor of Nuclear Engineering (573-882-9691; Ph.D. University of Illinois; Wide Band-Gap Electronic Materials: Syntheses, Doping and Devices, Diamond Film Heteroepitaxy, Syntheses of Diamond Films by Photochemistry, Forced Diffusion. [prelasm@missouri.edu]

Robert V. Tompson, Associate Professor of Nuclear Engineering (573-882-2881); Ph.D. University of Missouri 1988; Kinetic theory of gases, experimental and theoretical aerosol mechanics, neutron transport theory, nuclear reactor physics and safety. [tompsonr@ missouri.edu]

Other Faculty Evan Boote, Adjunct Assistant Professor of Nuclear Engineering, Assistant Professor of Radiology. **Julie Dawson,** Adjunct Assistant Professor of Nuclear Engineering, ABR. **Gary Ehrhardt,** Adjunct Assistant Professor of Nuclear Engineering, Research Reactor. **Michael Glascock,** Adjunct Assistant Professor of Nuclear Engineering, Research Reactor. **Kiratadas Kutikkad,** Adjunct Assistant Professor of Nuclear Engineering, Research Reactor. **Wynn A. Volkert,** Emeritus Professor, Nuclear Science and Engineering Institute, Professor of Radiology and Nuclear Engineering.

Other Information
Participating university for the DOE Applied Health Physics Fellowship Program. Affiliated closely with the Research Reactor (10 MWth) and its 100+ employees as engaged in research, isotope production, radiation services, and radioactivity shipment.

Sponsored Research Activities in Health Physics (2003 – Present)

Fellowship Support in the Area of Counterterrorism and Homeland Security
Principal Investigator: Tushar Ghosh **Agency:** U.S. Department of Education (GAANN) **Type:** Fellowship Support **Period:** 2006 - 2009 These fellowships provide student support in a variety of areas related to Counterterrorism and Homeland Security. Specific to Health Physics was research related nuclear plant security, material safe guard.

Fellowship Support in the Area of Nuclear and Radiological Science and Engineering
Principal Investigator: Mark Prelas **Agency:** U.S. Department of Education (GAANN) **Type:** Fellowship Support **Period:** 2006 - 2009 These fellowships provide student support in a variety of areas related to radiological science. Specific to Health Physics was research related to the uptake and dosimetry of BI-212 as a cancer therapy agent and new NAA techniques for measuring airborne pollutants captured on filters.

Fellowship Support in the Areas of Environmental/Environmental Health Engineering
Principal Investigator: Sudarshan Loyalka **Agency:** U.S. Department of Education (GAANN) **Type:** Fellowship Support **Period:** 2003 - 2007 Fellowship program supported by the Department of Education for PhD level studies in the area of environmental health and engineering. Students' research topics included shielding calculation for RTG system, development of bio-adsorbents for condensate polishers, development of nano-particles and coating via aerosol processes.

Minority-Majority Partnership Program Between University of Missouri-Columbia and Polytechnic University of Puerto Rico in Nuclear Engineering and Health Physics
Principal Investigator: William H. Miller **Agency:** U.S. Department of Energy **Type:** Education Support **Period:** 2004 - 2007 The Department of Energy Office of Nuclear Energy, Science and Technology (DOE/ONEST) University Partnership Program between the Polytechnic University of Puerto Rico and the University of Missouri-Columbia has two major objectives. The first is the direct financial support for Hispanic engineering students from PUPR to pursue doctoral degrees at MU in nuclear engineering and health physics. The second is support of collaboration between PUPR and MU faculty leading initially to creation of an undergraduate specialty area in Nuclear Engineering at PUPR, with the long-term objective of implementing an undergraduate nuclear engineering degree program.

Colon Cancer Specific Radiodiagnostic Therapeutic Agents
Principal Investigator: Timothy Hoffman **Agency:** National Institutes of Health **Type:** Research Contract **Period:** 2002 – 2005 This grant is studying several different high energy beta emitters as possible radiopharmaceutical agents. Part of this study involves organ and tumor specific dose estimates based upon experimental biodistribution data. The MIRD method is being employed, along with Monte Carlo calculations, to determine “S” factors for predicting dose in all organs of interest.

Development of Perlite Based Adsorbents for the Removal of Lead and Mercury Vapors:
Principal Investigator: Tushar Ghosh **Agency:** U.S. Department of Army (CERL) **Type:** Research Support **Period:** 2002 - 2003 This research resulted in the development of bioadsorbents for the removal of heavy metals from both radioactive and non-radioactive sources.

Development of Perlite Based Adsorbents for the Removal of Lead and Mercury Vapors
Principal Investigator: Tushar Ghosh **Agency:** U.S. Department of Army (CERL) **Type:** Research Support **Period:** 2002 - 2003 This research resulted in the development of bioadsorbents for the removal of heavy metals from both radioactive and non-radioactive sources.

High Efficiency Solid State Detector

Principal Investigator: William H. Miller **Agency:** Subcontract of Office of Naval Research grant to University of Missouri – Kansas City (Anthony Caruso, PI) **Type:** Office of Naval Research Grant **Period:** 2010-2011

The purpose of this grant is to develop new, solid state device neutron detectors for safeguards implementation. MU's scope of work includes providing neutron sources (thermal beams, PuBe and 252Cf) for testing prototype devices fabricated at UMKC, assisting with the design and implementation of electronic systems for acquiring pulse height spectra on fabricated diodes as of function of boron carbide thickness (and possibly hydrogen loading) and moderator thickness, and running MCNPX calculations on solid state devices in multiple geometries as a function of boron carbide thickness, hydrogen loading, and moderator thickness.

23. UNIVERSITY OF NEVADA LAS VEGAS

Department of Health Physics Telephone: (702) 895-4320 / Fax: (702) 895-4819

Chair:
Dr. Steen Madsen
Box 453037
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Las Vegas, Nevada 89154-3037
email: steen.madsen@unlv.edu

HP Degrees Granted:
B.S. in Health Physics
M.S. in Health Physics
Ph.D. in Radiochemistry

Remote Delivery of Course: None

HP Degrees Granted:
PhD in Physics and Astronomy

Health Physics Faculty (≥25% FTE toward the HP program)

Steen J. Madsen, Chair Department of Health Physics, 702-895-1805, PhD McMaster University (Canada) 1992; Lasers in therapeutic and diagnostic medicine, radiation therapy physics. [steen.madsen@unlv.edu]

Phillip W. Patton, PhD University of Florida 2000; Bone dosimetry, internal dosimetry, and diagnostic medical imaging. [phillip.patton@unlv.edu]

Marcos A. Cheney, PhD University of California, Davis 1989; Environmental chemistry and health physics. [marcos.cheney@unlv.edu]

Ralf Sudowe, Ph.D. Philipps-Universität Marburg, Germany 1999, Behavior of radionuclides in the environment, radioanalytical methods, nuclear forensics

Other information
A M.S. degree in Health Physics was established in 1996. The Department includes undergraduate programs in nuclear medicine and comprehensive medical imaging. The B.S. in the Health Physics program offers a 3+2 year dual degree program with Fort Valley State University in Fort Valley, Georgia. Students receive B.S. degrees in health physics and in biology, chemistry, or mathematics. A Ph.D. degree in Radiochemistry was established by the Depts. of Health Physics and Chemistry in 2004.

Sponsored Research Activities in Health Physics (2003 – Present)

Development of a Radioanalytical Counting Laboratory for Support of Education and Evaluation of Environmental Samples
Principal Investigator: Steen Madsen **Co-Investigators:** Ken Czerwinski **Agency:** US Department of Energy **Type:** Research Grant **Period:** 2005 – 2008 The purpose of this grant is to establish a radioanalytical laboratory for educational purposes and for evaluation of environmental samples.

Advances in Skeletal Dosimetry through Microimaging
Principal Investigator: Wesley E. Bolch **Co-Investigators:** Derek Jokisch, Phillip Patton, George Sgouros **Agency:** National Institute of Health, National Cancer Institute **Type:** Research Grant R01 **Period:** 2003 – 2007 This work seeks to improve estimates of radiation doses to the skeleton from internal emitters. High resolution computed tomography (CT) and magnetic resonance imaging (MRI) of human skeletal sites is used to provide both the microstructural geometry necessary for Monte Carlo transport and the target masses necessary for calculation of radionuclide S-values. Further, the study seeks to establish a database of reference patients and methods for scaling to individual patients.

Analyses of the Dose Risk to Civilians from High-Energy X-Ray Equipment Used for the Detection of Weapons of Mass Destruction at Various US Entry Locations
Principal Investigator: Phillip W. Patton **Agency:** UNLV Institute of Security Services **Type:** Summer Research Award **Period:** 2007 The primary focus of this research is to determine the optimal bremsstrahlung spectrums to use to minimize dose to civilians and still produce usable data for the detection of weapons of mass destruction located in cargo containers.

Dose Calculations for New Imaging Technologies Used in the Detection of Radiological Weapons of Mass Destruction
Principal Investigator: Phillip W. Patton **Agency:** UNLV Research Foundation **Type:** Research Grant **Period:** 2005 - 2006 The long term goal of this project is to calculate the dose a person located inside a cargo shipment might receive due to new screening techniques using x-rays.

Post-implant Dosimetry Analysis of Iodine-125 Permanent Seed Brachytherapy by Delineation of Prostate Volumes Using Magnetic Resonance Pre-implant and Post-implant Imaging Modality
Principal Investigator: Phillip W. Patton **Agency:** UNLV Office of Research Services **Type:** Applied Research Initiative Grant **Period:** 2005 – 2006 The purpose of this grant is to evaluate the utility of MRI for delineation of prostate volumes.

Border intelligence and detection system
Co-Principal Investigator: Steen Madsen **Agency:** State of Nevada **Type:** Research Grant **Period:** 2005 – 2006 The objective of this project is to construct an airborne radiation monitoring system for homeland security and other aerial surveillance applications.

The use of Motexafin Gadolinium as a contrast agent in intraoperative magnetic resonance imaging
Co-Principal Investigator: Steen Madsen **Agency:** Pharmacyclics, Inc. **Type:** Industry-sponsered Research Grant **Period:** 2005 – 2006 The aim of this project is to investigate the utility of a novel contrast agent in rat brains.

Combined Photodynamic and Radiation Therapy of Brain Tumors
Principal Investigator: Steen Madsen **Agency:** State of Nevada, University of California, Irvine **Type:** Research Grant **Period:** 2001 – 2005 The overall objective of this project was to investigate the response of human glioma spheroids to combined photodynamic therapy and ionizing radiation.

Dose Calculations for New Imaging Technologies Used in the Detection of Radiological Weapons of Mass Destruction
Principal Investigator: Phillip W. Patton **Agency:** UNLV Research Foundation **Type:** Research Grant. **Period:** 2005 – 2006 The long term goal of this project is to calculate dose distributions inside cargo containers resulting from new x-ray screening techniques.

Protoporphyrin IX Distributions in Rat Brain
Co-Principal Investigator: Steen Madsen **Agency:** PhotoCure, ASA **Type:** Industry-sponsored Research Grant **Period:** 2002 – 2004 The overall objective of this work was to evaluate the biodistribution of a novel lipophilic photosensitizer in a rat brain tumor model.

Repetitive Photodynamic Therapy for the Treatment of Rat Brain Tumors
Principal Investigator: Steen Madsen **Agency:** American Cancer Society **Type:** Research Grant (BRIN) **Period:** 2003 – 2004 The goal of this work was to investigate the efficacy of fractionated ALA Photodynamic therapy in human glioma spheroids.

Development of Dose Coefficients for Radionuclides Produced in Spallation Neutron Sources
Principal Investigator: Phillip Patton **Co-Investigators:** Mark Rudin, Keith Eckerman (ORNL) **Agency:** US Department of Energy **Type:** Research Grant **Period:** 2001 – 2004 The major goal of this project is to produce dose coefficients for radionuclides that are generated from the bombardment of mercury targets.

Migration Properties of Depleted Uranium from Naval Ordnance in Arid Environments
Principal Investigator: William Johnson **Co-Investigator:** Brenda Buck **Agency:** Argonne National Laboratory **Type:** Research Grant **Period:** 2002 – 2003

This project established site-specific migration parameters and uranium activity concentrations for depleted uranium corrosion products in an arid environment. Data obtained from this study was used to support modeling of the human health and ecological risk from depleted uranium ordnance.

Development of In Situ Gamma-Ray Spectroscopy Experiments
Principal Investigator: William Johnson **Agency:** NSF-DUE **Type:** Research Grant **Period:** 2000 - 2003 This project developed undergraduate experiments related to the theory and application of in-situ gamma ray spectrometry. It was part of a larger project of introducing an inquiry-based laboratory curriculum in our undergraduate laboratories.

24. THE UNIVERSITY OF TENNESSEE

Department of Nuclear Engineering Telephone:
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Program Director:
Dr. H.L. Dodds
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The University of Tennessee Knoxville, Tennessee
37996-2300
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HP Degrees Granted:
B.S. in Nuclear Engineering (concentration in Radiological Engineering)
M.S. in Nuclear Engineering (concentration in Radiological Engineering)
Ph.D. in Nuclear Engineering (concentration in Radiological Engineering)

Remote Delivery of Course: A fully on-line M. S. degree in Nuclear Engineering (concentration in radiological Engineering) is available with synchronous delivery of all courses in the program over the Internet.

Health Physics Faculty (≥25% FTE toward the HP program)

L. F. Miller, Professor of Nuclear Engineering (865-974-5048); Ph.D. Texas A&M University 1976; Radiological assessments, radiation dosimetry, nuclear instrumentation, neural networks, computational methods. [lfmiller@utk.edu]

R. E. Pevey, Associate Professor of Nuclear Engineering (865-974-5048); Ph.D. Tennessee 1982, P.E.; Shielding and radiation transport, reactor physics, thermal hydraulics, and computer methods. [rpevey@utk.edu]

L. W. Townsend, Professor of Nuclear Engineering (865-974-5048); Ph.D. Idaho 1980; Theoretical nuclear, atomic, and molecular physics; radiation physics; transport theory; gas kinetic theory; space radiation shielding. [ltownsen@utk.edu]

Other Faculty **Keith Eckerman,** Adjunct Professor of Nuclear Engineering I**ulian Apostoaei**, Adjunct Professor of Nuclear Engineering **Chet Ramsey**, Adjunct Professor of Nuclear Engineering **Trent Nichols**, Adjunct Professor of Nuclear Engineering **Paul Frame, CHP,** Adjunct Professor of Nuclear Engineering **Gloria Mei,** Adjunct Professor of Nuclear Engineering **James Turner, CHP,** Adjunct Professor of Nuclear Engineering **Hanna M. Moussa,** Research Assistant Professor of Nuclear Engineering

Other Information
Our Adjunct Faculty are composed primarily of professionals from Oak Ridge National Laboratory or Oak Ridge Associated Universities who teach health physics courses and/or direct graduate student research.

Visiting Faculty Financial Assistance
Office and secretarial support would be provided.

Student Financial Assistance
Scholarships, fellowships, student teaching and research assistantships.

Research Facilities
Nuclear instrumentation laboratory, reactor simulator, ^{252}Cf irradiation facility, computing laboratory, natural uranium graphite-moderated subcritical assembly, natural uranium water-moderated subcritical assembly, sample assay laboratory, wet radiochemistry laboratory. Additional facilities located at ORNL are also available to us.

Sponsored Research Activities in Health Physics (2003 – Present)

Earth-Moon-Mars Radiation Exposure Module (EMMREM)
Principal Investigator: Lawrence W. Townsend **Agency:** NASA (LWS program) **Type:** Grant **Period:** 2006 – 2011 The goal is to develop modular software that provides complete characterization and propagation of the radiation environment from the various sources, through the inner heliosphere, spacecraft structure, and into tissue of crewmembers, at any time during the solar cycle, at any location in the solar system.

Lunar Reconnaissence Orbiter CRaTER Detector
Principal Investigator: Lawrence W. Townsend **Agency:** NASA Goddard Space Flight Center (subcontract through Boston University) **Type:** Grant **Period:** 2005 – 2009 This work involves characterizing the radiation response of the CRaTER detector (Cosmic Ray Telescope for the Effects of Radiation), an LET spectrometer that will be flown on the Lunar Reconnaissance Orbiter (LRO) spacecraft in late 2008.

Advanced Forecasting Methodologies for Solar Particle Event Radiation Exposures
Principal Investigator: Lawrence W. Townsend **Co-Investigators:** John S. Neal; J. Wesley Hines **Agency:** NASA Goddard Space Flight Center **Type:** Grant **Period:** 2006 – 2009 This work involves developing artificial intelligence and Bayesian Inference methods for forecasting dose versus time profiles for operational use in future human space exploration. The goal is to produce usable operational software implementing the developed forecasting methods.

Radiation Transport Code Development for Space Radiation Shielding Applications
Principal Investigator: Lawrence W. Townsend **Co-Investigators:** Tony A. Gabriel (SID, Inc.); Lawrence Pinsky (U. Houston); Abdulnasser F. Barghouty (Roanoke College); James Adams (NASA); John Watts (NASA); John W. Wilson (NASA); Thomas Wilson (NASA) **Agency:** NASA **Type:** Research Grant **Period:** 2003 – 2007 This work involves development of a suite of galactic cosmic ray transport codes for NASA by a consortium of educational institutions and government laboratories (The NASA Space Radiation Transport Code Development Consortium). The codes will be used for assessing risk and estimating shielding requirements for human exploration missions in deep space. The work is being accomplished by extending the 3D Monte Carlo HETC transport code system (UT and SID Inc.), developed at ORNL, and the 3D Monte Carlo FLUKA radiation transport code system (UH, NASA and CERN), developed at CERN, to do energetic heavy ion transport. In addition, the 1D deterministic space radiation transport HZETRN will be extended to three dimensions (UT, NASA and Roanoke College).

Particle Transport Assessment of GCR Shielding Materials
Principal Investigator: Louis K. Mansur (ORNL) **Co-Investigators:** Igor Remic (ORNL) and Lawrence W. Townsend (UT) **Agency:** NASA (UT subcontract through Oak Ridge National Laboratory) **Type:** Research Grant **Period:** 2003 – 2007 This work involves developing multifunctional space radiation shield materials for applications in crewed spaceflight.

Continuous Cross Section Database Development for Generalized Three Dimension Radiation Transport Codes
Principal Investigator: Lawrence W. Townsend **Co-Investigator:** Thomas M. Miller **Agency:** NASA **Type:** NASA Graduate Student Researcher Program Fellowship **Period:** 2002 – 2005 This work involves developing double differential (in angle and energy) cross section models of secondary particle production from high-energy nucleon-nucleus and nucleus-nucleus interactions for inclusion in the event generator being developed for the HETC radiation transport code.

Advanced Warning Methodologies for Solar Particle Event Radiation Exposures
Principal Investigator: Lawrence W. Townsend **Co-Investigators:** John S. Neal; J. Wesley Hines **Agency:** NASA (LWS Program) **Type:** Research Grant **Period:** 2002 – 2005 This work involves developing artificial neural network and Bayesian Inference methods to forecast the dose versus time profiles of astronaut doses resulting from exposures to solar energetic particle events using only dosimeter readings obtained early during the onset of the event.

Development of a Monte Carlo Radiation Transport Code System for HEDS
Principal Investigator: Lawrence W. Townsend **Co-Investigator:** Tony A. Gabriel (SID, Inc.) **Agency:** NASA **Type:** Research Grant **Period:** 2000 – 2004 This work involves development of a galactic cosmic ray transport code for NASA's Human Exploration and Development of Space (HEDS) program. The code will be used for estimating shielding requirements for human exploration missions in deep space. The work is being accomplished by extending the HETC transport code system developed at ORNL to do energetic heavy ion transport. Part of the work involves developing an event generator describing the nuclear interactions of these energetic nuclei for inclusion into the HETC transport code system.

25. VANDERBILT UNIVERSITY

Department of Physics and Astronomy
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http://www.physics.vanderbilt.edu/

Program Director:
Michael G. Stabin, PhD, CHP
Assistant Professor of Radiology and Radiological Sciences
Department of Radiology and Radiological Sciences
Vanderbilt University,
1161 21st Avenue South
Nashville, TN 37232-2675
email: michael.g.stabin@vanderbilt.edu

HP Degree Granted:

MS in Physics and Astronomy (Health Physics)
PhD in Physics and Astronomy

Health Physics Faculty (≥25% FTE toward the HP program)

Dr. Michael Stabin, Asst Professor of Radiology and Radiological Sciences; Introduction to Health Physics, Radiation Dose Assessment (Advanced Health Physics), Radiation Detection and Measurement (michael.g.stabin@vanderbilt.edu)

Dr. Ron Price , Professor of Radiology and Radiological Sciences; Physics of Medical Imaging (ron.price@vanderbilt.edu)

Dr. Michael Freeman , Assoc. Professor of Radiology and Radiological Sciences; Radiation Biophysics (michael.freeman@Vanderbilt.Edu)

Dr. Shane Hutson, Assistant Professor, Department of Physics & Astronomy; Physical Analysis of Biological Systems (shane.hutson@vanderbilt.edu)

Dr. A. V. Ramayya, Professor of Physics and Astronomy, Advanced laboratory: Nuclear Physics; (a.v.ramayya@vanderbilt.edu)

Dr. A. Sait Umar, Professor of Physics; Computational Physics (umar@compsci.cas.vanderbilt.edu)

D. James Clark, Professor of Civil and Environmental Engineering; Environmental Engineering Laboratory (james.h.clarke@vanderbilt.edu)

Dr. Frank Parker, Distinguished Professor of Civil and Environmental Engineering; Radiological Aspects of Environmental Engineering (parkerfl@vuse.vanderbilt.edu)

Dr. Mark David Abkowitz, Professor of Civil Engineering & Management of Technology, Director, Vanderbilt Center for Environmental Management Studies, Environmental Risk Management, Geographic Information Systems (mark.abkowitz@vanderbilt.edu)

Dr. Sankaran Mahadevan, Professor of Civil and Environmental Engineering; Reliability and Risk Case Studies, Probabilistic Methods in Engineering Design (sankaran.mahadevan@vanderbilt.edu)

Dr. Eugene J. LeBoeuf, Associate Professor of Civil and Environmental Engineering; Pollutant Transport in the Environment (eugene.j.leboeuf@vanderbilt.edu)

Other Information
Students enrolled in the Health Physics Program in the Dept of Physics and Astronomy may choose to concentrate their studies in one of three areas: (1) medical radiation dosimetry, (2) environmental radiation studies, or (3) basic physics.

Student Financial Assistance
Scholarships, fellowships, and assistantships may be available through the Department, the College of Arts and Sciences, and the University. The Department is an approved site for the DOE Nuclear Engineering and Health Physics Fellowships.

Research Facilities
CENTER FOR MOLECULAR IMAGING, Dr. Robert Kessler, Director VANDERBILT UNIVERSITY INSTITUTE OF IMAGING SCIENCE, Dr. John Gore, Director
W. M. KECK VANDERBILT FREE-ELECTRON LASER CENTER, Dave Piston, Director

Professional Certification
The M.S. and Ph.D. programs in health physics prepare the student for Part I of the certification examination administered by the American Board of Health Physics. Eligibility of Part II of examination is based on professional experience.

Sponsored Research Activities in Health Physics (2003 – Present)

Multidisciplinary Research Training in Cancer Imaging
Principal Investigator: Ron Price **Agency:** NIH/NCI **Type:** Training Grant **Period:** 2007 - 2012 The goal of this project is to establish a unique training program in cancer imaging research and is designed to train both medical post-doctoral candidates with extensive experience in medical imaging, oncology or cancer biology, and basic-science post-doctoral candidates with extensive experience in imaging technology or cancer biology.

Consortium for Risk Evaluation with Stakeholder Participation CRESP III
Principal Investigator: David A. Kosson **Agency:** Consortium for risk evaluation and stakeholder participation **Type:** Research Grant **Period:** 2006 - 2009 The mission of CRESP III is to advance cost-effective, risk-informed cleanup of the nation's nuclear weapons production facility sites and cost effective, risk-informed management of potential future nuclear sites and wastes.

New Methods for Improved Image-Based Dosimetry
Principal Investigator: Michael G. Stabin **Agency:** NIH/NCI **Type:** Research Grant **Period:** 2004 - 2008 The goal of this project is to determine the accuracy of activity estimation from the quantitative methods and reconstruction algorithms, through comparison of measured activity values in simple and complex anthropomorphic phantoms to known values.

Realistic Phantoms Series for OLINDA/EXM
Principal Investigator: Michael G. Stabin **Agency:** NIH/NCI **Type:** Technology Transfer Grant **Period:** 2005 – 2008 The goal of this project is to review and testing of existing work, identification of specific phantoms necessary to complete the OLINDA/EXM library and gathering of candidate image data sets for segmentation

26. VIRGINIA COMMONWEALTH UNIVERSITY

Program Directors:

Dr. Sama Bilbao y Leon, PhD
http://www.egr.vcu.edu/me/
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Associate Professor, Director of Nuclear Engineering Programs
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Professor and Director, Medical Physics Graduate Program
Department of Radiation Oncology
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804 628-7771 (Phone)
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email: JSiebers@vcu.edu

Degree Granted:

BS in Mechanical Engineering with an optional Nuclear Engineering Major Concentration

MS in Mechanical and Nuclear Engineering

MS and PhD in Medical Physics

PhD in Engineering

Faculty

Dr. Ross Anderson, P.E., STA, Associate Professor of Mechanical and Nuclear Engineering; Reliability and Safety of Nuclear Power Plants (RCAnderson@vcu.edu)

Dr Sama Bilbao y Leon, Associate Professor of Mechanical and Nuclear Engineering, Director of Nuclear Engineering Programs; Nuclear Thermal-Hydraulics, Nuclear Safety, Nuclear Reactor Design, Energy and Environmental Policy (SBilbao@vcu.edu)

Dr. Brian Hinderliter, CHP, PE , Associate Professor of Mechanical and Nuclear Engineering, Radiation Transport and Shielding, Materials (BHinderliter@vcu.edu)

Dr. Jeffrey Siebers, Professor and Director, Medical Physics Graduate Program; Medical physics, Medical Imaging and Radiation Transport (JSiebers@vcu.edu)

Dr. Gary Tepper, Professor and Chair of Mechanical and Nuclear Engineering; Nuclear Instrumentation and Measurement (gtepper@vcu.edu)

Dr. Gokul Vasudevamurthy, Assistant Professor of Mechanical and Nuclear Engineering, Nuclear Materials, Thermal Hydraulics.

Other Information
Students enrolled in the Mechanical and Nuclear Engineering Program may choose to concentrate their studies in Nuclear Engineering.

Student Financial Assistance
Scholarships, fellowships, and assistantships may be available through the Departments and the University. The Department of Mechanicals and Nuclear Engineering is an approved site for the DOE Nuclear Engineering and Health Physics Fellowships.

Research Facilities

RADIATION MEASUREMENT LAB
The Radiation Measurement Laboratory maintains instruments for the detection and measurement of alpha, beta and gamma radiation, thus providing VCU's nuclear engineering students with a strong background in the practical application of the theory and practice of radiation interactions, detection and measurement. The laboratory includes Geiger-Mueller survey detectors, gas counters capable of operating in the ionization, proportional, and GM regimes, and NaI(Tl) scintillation spectrometers. The laboratory is used both in the educational and research programs.

VISIBLE REACTOR LAB
VCU's Visible Reactor is a small (3 kW) thermal reactor patterned after a full scale Pressurized Water Reactor (PWR). The various components of the reactor are transparent, which allow students to visualize the thermal hydraulics and heat transfer phenomenology taking place in the system. The Visible Reactor is equipped with a human-machine interface that allows operators to control and regulate the actuation of the various components and to monitor pressure, temperature and flow throughout the system.
The Visible Reactor has been designed and built by VCU students (mechanical, nuclear and electrical engineering) under the direction of VCU's faculty, and new features are being added by the students every semester. VCU's Visible Reactor is also routinely used as an instructional tool for various nuclear engineering courses, as it enables the study of energy generation and heat transfer, pressure control in a two-phase system, reactor core subcooling, operation of steam generators, as well as the use of measurement instrumentation.

NUCLEAR SIMULATOR LAB
VCU's Nuclear Simulator consists of an internally-developed software model for a Pressurized Water Cooled Reactor (PWR), loaded onto a platform of three computers and twelve 22" monitors. The main workstation controls the instructor functions and the other two are for the primary and secondary sides respectively. The monitors are arranged similarly to a nuclear control room simulator, displaying instrumentation readouts and annunciators. The VCU Nuclear Simulator allows operator control of the same major components as a control room operator: control rods and boration/dilution; pressurizer heaters, sprays and relief valves, on the primary system; and steam demand valves, steam generator level control and feedwater pumps on the secondary side; all among other components. The available controls deliberately replicate those that are available to an actual nuclear plant operator, as do the indications, both in function and in appearance. The indicators respond in real time. In addition, the mathematical models programmed into the simulator logic are based upon first principles and benchmarked against plant data as much as possible. The VCU Nuclear Simulator has been designed and built entirely by VCU students under the direction of VCU's faculty, and new capabilities are added to the simulator by the students every semester. VCU's Nuclear Simulator is also routinely used as an instructional tool for various nuclear engineering courses.

Professional Certification
The M.S. and Ph.D. programs in nuclear engineering prepare the student for Part I of the certification examination administered by the American Board of Health Physics. Eligibility of Part II of examination is based on professional experience.

VCU Department of Mechanical and Nuclear Engineering Presentation