HEALTH PHYSICS EDUCATION REFERENCE BOOK

2007 - 2008

Health Physics Society
Academic Education Committee

Compiled and Edited by

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Programs with Degrees or Options in HP	Location	Degrees Granted			
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	
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. Uniformed Services University	Maryland			MS	PhD
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

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 Health Physics (BS) (2003)
Uniformed Services University	Health Physics (MS) (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) 389-4107 / 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

	BS
HP Enrollment (Fall 2007):	14
HP Graduates (9/06 to 8/07):	5
HP Graduates (9/05 to 8/06):	1

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

Jack G. Couch, Professor Emeritus of Physics (717-389-4152); Ph.D. Texas A&M University 1966; Nuclear instrumentation, environmental radiation measurements, applied health physics. [jcouch@bloomu.edu] (retired June 2007)

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]

New faculty member currently being recruited

Other Faculty Contributing to the Health Physics Program
Nathaniel Greene, PhD, Associate Professor of Physics
Gunther L. Lang, PhD, Assistant 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)
American Association of Physicists in Medicine Fellowship awarded to a student for research during the summer of 2007 in the Radiation Therapy group of Geisinger Medical Center, Danville, PA

2. CLEMSON UNIVERSITY

Department of Environmental Engineering and Science
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
email: tim.devol@ces.clemson.edu
website: http://www.ces.clemson.edu/ees

HP Degrees Granted:
M.S. in Environmental Engineering and Science (ABET ASAC accredited)
Ph.D. in Environmental Engineering and Science

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2007):	7	4
HP Graduates (9/06 to 8/07):	2	0
HP Graduates (9/05 to 8/06):	3	2

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

Robert A. Fjeld, The Jerry E. and Harriet Calvert Dempsey Professor of Waste Management; and Professor of Environmental Engineering and Science (864-656-5569); Ph.D. The Pennsylvania State University 1976; Environmental transport, dose and risk assessment, waste management. [fjeld@clemson.edu]

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

Brian A. Powell, Assistant Professor of Environmental Engineering and Science; Ph.D. Clemson University 2004; Environmental radiochemistry, radiochemical separations of actinides, radioactive waste management, environmental restoration.

Other Faculty
Michael G. Bronikowski, Adjunct Associate Professor
Elizabeth Carraway, Associate Professor of Environmental Engineering and Science
David DiPrete, Adjunct Associate Professor
John C. Coates, Associate Researcher/Associate Professor of Environmental Engineering and Science
Alan W. Elzerman, Professor and Chair of Environmental Engineering and Science
David L. Freedman, Professor of Environmental Engineering and Science
C. P. Leslie Grady, Jr., Professor of Environmental Engineering and Science, Emeritus
Steven Hoeffner, Adjunct Associate Professor
Tanju Karanfil, Professor of Environmental Engineering and Science
Cindy M. Lee, Professor of Environmental Engineering and Science
Thomas J. Overcamp, Professor of Environmental Engineering and Science
Fred J. Molz, III, Professor of Environmental Engineering and Science
James D. Narvatil, Professor of Environmental Engineering and Science, Emeritus
Frank L. Parker, Eminent Scientist
Mark A. Schlautman, Associate Professor of Environmental Engineering and Science
Steven M. Serkiz, Adjunct Associate Professor

Other Information

Environmental Engineering and Sciences is a graduate-only department where students specialize in one of six focus areas. Health physics students select the environmental health physics focus area, which is concerned with environmental and waste management aspects of nuclear technologies and the nuclear fuel cycle. These aspects include environmental health physics; radioactivity measurement; hazardous, radioactive, and mixed waste treatment and disposal; risk assessment; and transport of radioactive contaminants in the environment. Currently active projects include (1) actinide transport mechanisms in the subsurface, (2) development of radiochemical detectors for environmental applications, (3) development of on-line instrumentation for automated nuclear waste process monitoring, and (4) risk assessment. In addition, an internship program is available through which students may work on a variety of environmental restoration, waste management, environmental health physics and radiochemistry projects at Department of Energy facilities.

Student Financial Assistance

Fellowships, Student Research Assistantships, Student Teaching Assistantships, DOE Internships (limited to U.S. citizens).

Research Facilities

The Department of Environmental Engineering and Science is located in a 40,000 square foot office and laboratory facility in the Clemson Research Park. 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, sixteen gas-flow proportional counters, 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. These facilities are specially designed for research and treatment technologies related to hazardous, radioactive, and mixed wastes. Please visit our web site at http://www.ces.clemson.edu/ees for more information on our department. Graduate school applications may be found at http://www.grad.clemson.edu.

Sponsored Research Activities in Health Physics (2003-Present)

Radionuclide Sensors for Water Monitoring

Principal Investigator: Jay W. Grate (PNNL),
Co-Investigators: Timothy A. DeVol, and Oleg Egorov (PNNL)
Agency: US Department of Energy - EMSP
Type: Research Grant **Period:** 1999 – 2005, 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.

Establishment of a "Pilot Program" in Radiochemistry at South Carolina State University

Principal Investigator: Kenneth Lewis, South Carolina State University
Co-Investigator: Timothy A. DeVol, Robert A. Fjeld
Agency: National Nuclear Security Agency
Type: Education Grant **Period:** 2005 - 2008

The goal of this project is to develop a radiochemistry program at South Carolina State University while training the first students in the program.

CLEMSON UNIVERSITY (continued)

Laboratory Kd and Solubility Measurements of Concrete
Principal Investigator: John T. Coates
Agency: WSRC through SCUREF
Type: Research Grant **Period:** 2007
The goal of this project is to measure distribution coefficients of select activation and fission products for a specific concrete.

CAP88 Verification and Benchmarking
Principal Investigator: Timothy A. DeVol
Co-Investigator: Thomas J. Overcamp
Agency: Savannah River National Laboratory through SCUREF
Type: Research Grant **Period:** 2006
The goal of this project is to assist in the conversion from Cap88 Mainframe to Cap88 PC V3.0.

Laboratory Kd Measurements of Non-Contaminated Sediments from E-Area
Principal Investigator: Robert A. Fjeld
Co-Investigator: Timothy A. DeVol, John T. Coates
Agency: Savannah River National Laboratory through SCUREF
Type: Research Grant **Period:** 2006
The goal of this project is to make site specific distribution coefficient measurements as a function of depth to be incorporated into a modern contaminant transport model.

Modeling of the Long-Term Transport of Plutonium in the Vadose Zone at the SRNL
Principal Investigator: Fred J. Molz
Co-Investigators: Robert A. Fjeld
Agency: WSRC through SCUREF
Type: Research Grant **Period:** 2006
The goal of this project was to develop a contaminant transport model for plutonium mobility in unsaturated media.

Investigation of Ti-Doped Sorbents for Pu Separation in HLW Supernate Simulants
Principal Investigator: Robert A. Fjeld
Co-Investigator: Timothy A. DeVol
Agency: Department of Energy through SCUREF
Type: Research Grant **Period:** 2005 - 2006
The goal of this project is to investigate the capacity and selectivity of Ti-doped sorbents on the separation of plutonium from high-level waste supernate.

Automated Radiochemical Analysis Tools for Real-Time Monitoring of High-Level Nuclear Waste Process Streams
Principal Investigator: Oleg Egorov (PNNL)
Co-Investigators: Timothy A. DeVol, and Jay W. Grate (PNNL)
Agency: US Department of Energy - EMSP
Type: Research Grant **Period:** 2001 – 2004
The goals of this project are to develop automated radiochemical separations procedures and specialized instrumentation for on-line, near real-time monitoring of high level waste process streams.

Situation Awareness Monitor for Nuclear Events
Principal Investigator: Pat French, ADA Technologies, Inc.
Co-Investigator: Timothy A. DeVol
Agency: Department of Energy
Type: Research Grant, SBIR Phase I **Period:** 2003 - 2004
The goal of this project is to design a test a monitoring system for homeland security applications.

Graduate Research Internships
Principal Investigator: Robert A. Fjeld
Agency: US Department of Energy /Savannah River Site
Type: Research Grant **Period:** 1994 - 2004
The goal of this project is to fund graduate student internships as a means to increase the pool of graduates with training in nuclear related engineering and sciences. The students complete their M.S. thesis involving a Department of Energy problem. The internship requires that the student be resident at the Savannah River Site conducting their thesis research for a period of 12 weeks.

Technical Review of Concept Design for Salt Waste Processing Facility at the Savannah River Site
Principal Investigator: Alan W. Elzerman
Co-Investigators: Timothy A. DeVol and John T. Coates
Agency: Duratek
Type: Research Grant **Period:** 2002 - 2003
The goal of this project was to provide a technical review of one of the conceptual designs for the Salt Stone Facility that was to be located at the Savannah River Site for the processing of high level waste. In addition to the technical review of the overall process design, several reports were written regarding the analytical needs of the facility.

Plutonium Geochemistry
Principal Investigator: Robert A. Fjeld
Co-Investigators: Fred J. Molz and John T. Coates
Agency: WSRC through SCUREF
Type: Research Grant **Period:** 2003
The goal of this project was to investigate the plutonium oxidation state species of naturally weathered plutonium sources

Plutonium Oxidation State in SRS Groundwater
Principal Investigator: Robert A. Fjeld
Co-Investigators: Fred J. Molz and John T. Coates
Agency: Westinghouse Savannah River Company through SCUREF
Type: Research Grant **Period:** 2001 - 2003
The goal of this project was to investigate the mobility of plutonium oxidation state species in field lysimeters installed at the DOE Savannah River Site. Using field data, a contaminant transport model is being developed to model plutonium mobility in unsaturated media.

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/acadprog/grad/rhs_grad_prog.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) 491-6450
email: tborak@colostate.edu

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

Remote Delivery of Courses: None

	MS	PhD
HP Enrollment (Fall 2007):	9	2
HP Graduates (9/06 to 8/07):	0	1
HP Graduates (9/05 to 8/06):	1	0

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

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

J. F. Harmon, ABR (D,T). Assistant Professor (970) 297-4063, (970) 491-5417; Ph.D., Medical Physics, University of Florida; Medical imaging modalities. Optimization of therapeutic radiation oncology treatment methods. [Joseph.Harmon@colostate.edu]

Shawki A. Ibrahim, Professor (970-491-1593); Ph.D. New York University 1980; Radiochemistry. [sibrahim@colostate.edu]

F. Ward Whicker, Professor (970-491-5343); Ph.D. Colorado State University 1965; Radioecology. [Ward.Whicker@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
Michael H. Fox, Professor of Radiation Biology
Robert L. Ullrich, Professor of Radiation Biology

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 recently had a training grant in Radiochemistry that provided financial aid to students which was supported by the DOE.

Research Facilities

Low level counting laboratory, instrumentation and dosimetry laboratory, whole body counter, radioanalytical chemistry laboratory, 6-MV electron accelerator, 60Co and 137Cs 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.

Sponsored Research Activities in Health Physics (2003 – Present)

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.

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.

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 - 2008

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

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.

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.

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 226Ra 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.

Health Effects and Property Damage Resulting from Historical Radioactive Emissions

Principal Investigator: F. Ward Whicker
Agency: GTE Operations Support, Inc.
Type: Contract **Period:** 2003 - 2004

The goal of the project was to measure and interpret radionuclide deposition levels in a community that surrounds a former nuclear fuels processing facility.

Microdosimetry of High Energy Heavy Ions

Principal Investigator: Thomas Borak
Co-Investigators: C. Zeitlin, L Heilbronn, J. Miller
Agency: NASA
Type: NASA Specialized Center for Research and Training **Period:** 1997 – 2004

Experiments at particle accelerators are performed to characterize the response of a Tissue Equivalent Proportional Counter to HZE particles (H,He,C,O,Ne,Si,Fe) and neutrons, with energies similar to galactic cosmic rays, for radiation monitoring of astronauts during manned space missions.

Dosimetry and Clustering of Energy Deposition from Beta Particles Emitted by 3Hand 14C in the Nucleus of a Mammalian Cell

Principal Investigator: Thomas Borak
Co-Investigators: Joel Bedford and Valdimir Semenenko
Agency: National Institutes for Health
Type: Research Grant RO1 **Period:** 1999 – 2003

There is evidence that the terminal portions of an electron track have a larger RBE than the initial portions of a track. This research was designed to test this hypothesis by studying the effects on cells labeled with 3H (electrons originate and terminate in the nucleus) and 14C (electrons originate and terminate outside of the nucleus. A revised version of the transport code, NOREC, for electrons in liquid water has been developed (Rad. & Env. Biophysics, 42, 2003).

4. DUKE UNIVERSITY

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

Program Director:
Dr. Terry Yoshizumi
Department of Radiology and Occupational and Environmental Safety Office
Duke University, MC Box 3155
2214 Elder St., Durham, NC 27710
email: yoshi003@mc.duke.edu

HP Degrees Granted:
M.S. in Medical Physics with Health Physics Major
Ph.D. in Medical Physics with Health Physics Major

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2007):	0	2
HP Graduates (9/06 to 8/07):	1	0

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

Terry Yoshizumi, PhD, DABR, DABMP, DABSNM, Associate Professor of Radiology (919-668-3188); Ph.D. University of Cincinnati 1980; 1-D, 2-D, 3-D radiation detector development, assessment of medical radiation dosimetry, radiation protection in medical environment, small animal dosimetry, real-time diagnostic and interventional/cardiac cath dosimetry, shielding assessment. [yoshi003@duke.edu]

Mark Oldham, PhD, **DABMP**, Associate Professor of Radiation Oncology and Biomedical Engineering (919-668-0349); University of Newcastle-Upon-Tyne, UK 1991. Optical-imaging and 3-D dosimetry. Dr Mark Oldham heads the 3D Dosimetry Lab in the Dept of Radiation Oncology Physics. The lab has received NIH R01 funding to develop novel 3D dosimetry techniques incorporating optical-CT scanning of radiochromic plastic dosimeters. We are developing both the dosimeters and the dosimeter imaging systems through collaborations with MGS Research and Heuris Pharma LLC.
[mark.oldham@duke.edu]

Vaclav Vylet, PhD, Assistant Professor, Physics Department (919-668-3189); PhD Swiss Federal Institute of Technology, Switzerland 1987; Radiation Detection, Radiation Physics , Monte Carlo method in radiation transport, accelerator radiation protection, radiation shielding. [vashek.vylet@duke.edu]

Robert Reiman, MSPH, MD, DABNM, Assistant Professor of Radiology (919-668-3186); MSPH University of North Carolina 1974; MD Case Western Reserve University School of Medicine 1987. Anatomy and Physiology for Medical Physicists; radiation protection in medical environment; internal radiation dosimetry; risk communication. [robert.reiman@duke.edu]

Other Faculty Contributing to the Health Physics Program
Mark Dewhirst, Professor of Radiation Oncology (Radiation Biology)

Other Information
Students enrolled in the Medical Physics Program often engage their Master's and PhD studies in interdisciplinary fields, e.g., health physics & radiation oncology, health physics & diagnostic radiology, health physics & nuclear medicine.

DUKE UNIVERSITY (Continued)

Research Facilities

Duke 3-D Dosimetry laboratory
Joint Radiation Safety-TUNL Neutron Calibration and Measurement Laboratory
Joint Radiation Safety Office-Radiology Dosimetry Laboratory
Duke Radiation Safety Office Calibration Laboratory
Duke Triangle Universities Nuclear Laboratory
Duke Free Electron Laser Laboratory
Duke Animal Irradiator Laboratory
Duke Radiation Oncology Physics Laboratory
Duke Radiation Safety Office Physics Laboratory
Duke University PET Facility
Duke Radiation Oncology Linear Accelerators

Sponsored Research Activities in Health Physics (2003 - Present)

Center for Medical Countermeasures Against Radiation

Principal Investigator for Center Grant: Nelson Chao (Duke)
Agency: National Institute of Allergy and Infectious Diseases (NIAID), NIH
Type: Center Grant (U19 AI067798-02) **Period**: 2005 - 2010

Form a consortium termed Radiation Countermeasures Centers of Research Excellence (RadCCORE) to collectively and collaboratively increase possible agents to detect, mitigate and treat those people exposed to deterministic doses of radiation. The RadCCORE will address broad areas of research, ranging from methods to precisely measure external and internal radiation doses post-exposure to the development of new therapeutic products to prevent short- and long-term toxicities and will also have an important education and training component. The center has a focused balanced program of basic and translational research, with a strong emphasis on product development and deliverable therapies within 5 years.

Principal Investigator for *Health Physics Core*: Terry Yoshizumi (Duke);
Co-Investigators (*Health Physics Core*): Vashek Vylet (Duke), Mark Oldham (Duke)
Specific goals:

- Development of neutron dosimetry at Duke Triangle Nuclear Laboratory (TUNL)
- Monte Carlo calculations to predict contribution of scatter in experiment, to calculate energy deposition patterns in great detail, including spatial and energy distributions of secondary charged particles in specific small animal phantoms, and to establish conversion fluence-to-dose factors for mice or other small animals
- Improvement in small animal dosimetry in irradiators
- Application and development of 1-D, 2-D and 3-D dosimeters in detection of gammas and neutrons

Principal Investigators for *Education and Training Core*: Mike Robbins (Wake Forest); Terry Yoshizumi (Co-PI); Co-Investigators (*Education Core*): Robert Reiman (Duke), Vashek Vylet (Duke), Mark Oldham (Duke)

CT Dose Reduction

Principal Investigators: Terry Yoshizumi (Duke), Donald Frush (Duke)
Agency: GE Healthcare Research Fund
Type: Research Grant **Period:** 2006

Evaluation of the dose reduction potential of all non-cardiac tools provided on the GE VCT scanner. These include 3D mA modulation, bow tie filters, noise index for pediatric patients, patient centering, shutter mode.

Cardiovascular CT Dosimetry

Principal Investigators: Terry Yoshizumi (Duke), Lynne Hurwitz (Duke)
Agency: GE Healthcare Research Fund
Type: Research Grant **Period:** 2006

Dose reduction techniques for coronary CTA. Phantom investigation of all dose reduction tools available on the GE VCT and evaluating the dose savings achieved.

Development of Real-time CT Dose Assessment
Principal Investigators: Terry Yoshizumi (Duke)
Agency: GE Healthcare Research Fund
Type: Research Grant **Period:** 2003 - 2006
Development and application of real-time MOSFET technology in CT dose assessment with adult and pediatric anthropomorphic phantoms.

Dose Assessment in Body CT
Principal Investigators: Terry Yoshizumi (Duke), Rendon Nelson (Duke)
Agency: GE Healthcare Research Fund
Type: Research Grant **Period:** 2005
Dose reduction techniques for body CT.

Accurate High Resolution 3D Dosimetry
Principal Investigator: Mark Oldham (Duke), scored 176 (6.1 percentile)
Agency: National Institute of Health (R01 Application) CA100835-02
Type: R01 Research Grant **Period:** 2003 - Present
Title: Accurate high resolution 3D dosimetry. Project incorporates optical-CT scanning and radiochromic dosimeters.

5. FRANCIS MARION UNIVERSITY

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

Program Director:
Dr. David M. Peterson
Department of Physics & Astronomy
Francis Marion University
P.O. Box 100547
Florence, South Carolina 29501
(803) 661-1445
email: dpeterson@fmarion.edu

HP Degrees Granted:
B.S. in Health Physics

Remote Delivery of Course: None

	BS
HP Enrollment (Fall 2007):	18
HP Graduates (9/06 to 8/07):	3
HP Graduates (9/05 to 8/06):	1

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

David M. Peterson, Professor of Physics (803-661-1445); Ph.D. North Carolina State University 1973; Nuclear physics, instrumentation. [dpeterson@fmarion.edu]

R. Seth Smith, Pee Dee Electric Cooperative Professor of Physics (803-661-1453); 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**,** Assistant Professor of Physics/Health Physics (843-661-1444); Ph.D. Texas A&M University 1993; Health physics, electronics. [pfulmer@fmarion.edu]

Other Supporting Faculty
Jeannette Myers, Assistant Professor of Astronomy
David Anderson, Assistant Professor of Physics
Larry Engelhardt, Assistant Professor of Physics
Joe Mehaffey, Instructor of Physics
Joe Owczarzak, 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.

Research Facilities
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.

Professional Certification

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

Sponsored Research Activities in Health Physics (2003 – Present)

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.

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.

	AS	BS	MS	PhD
HP Enrollment (Fall 2007):	8	5	35	12
HP Graduates (9/06 to 8/07):	0	2	3	2
HP Graduates (9/05 to 8/06):	2	2	4	0

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 Urbane-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

IDAHO STATE UNIVERSITY (continued)

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.

IDAHO STATE UNIVERSITY (continued)

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: Laurence.friedman@iit.edu

IIT Health Physics Website: mhp.iit.edu

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

Remote Delivery of Courses: Yes

	Certificate	PSM
HP Enrollment (Fall 2007):	4	60
HP Graduates (9/06 to 8/07):	1	9
HP Graduates (9/05 to 8/06):	0	8

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. [Laurence.friedman@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

Panakkal Job (Adjunct Professor), Radiation Physicist of National Synchrotron Light Source at Brookhaven National Laboratory (631.344.4416); Ph.D. University of Bombay 1982. [pkjob@bnl.gov].

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].

ILLINOIS INSTITUTE OF TECHNOLOGY (continued)

Advisory Panel

Herman Cember, Ph.D., CHP, P.E.
Professor Emeritus, Northwestern University; Author of *Introduction to Health Physics*

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

	AA
HP Enrollment (Fall 2007)	28
HP Graduates (9/06 to 8/07)	14
HP Graduates (9/05 to 9/06)	6

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

	MS	PhD
HP Enrollment (Fall 2007):	0	0
HP Graduates (9/06 to 8/07):	0	0
HP Graduates (9/05 to 8/06):	0	0

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

Kenneth Hogstrom, Professor of Physics; Director, Medical and Health Physics Program Office (225-578-0590); 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 (225-578-2747); 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).

LOUSIANIA STATE UNIVERSITY (continued)

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

	MS	PhD
HP Enrollment (Fall 2007):	3	0
HP Graduates (9/06 to 8/07):	0	0
HP Graduates (9/05 to 8/06):	2	0

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.

	BS	MS	MHP	PhD
HP Enrollment (Fall 2007):	33	22	17	5
HP Graduates (9/06 to 8/07):	7	1	0	1
HP Graduates (9/05 to 8/06):	6	7	0	0

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]

OREGON STATE UNIVERSITY (continued)

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.

OREGON STATE UNIVERSITY (continued)

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.

OREGON STATE UNIVERSITY (continued)

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)

	BS	MS	PhD
HP Enrollment (Fall 2007):	73	5	2
HP Graduates (9/06 to 8/07):	18	3	0
HP Graduates (9/05 to 8/06):	26	1	0
MP Enrollment (Fall 2007):	-	7	16
RB Enrollment (Fall 2007):	-	-	2

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

PURDUE UNIVERSITY (continued)

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.

PURDUE UNIVERSITY (continued)

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

	BS	MS	PhD
HP Enrollment (Fall 2007):	20	2	8
HP Graduates (9/06 to 8/07):	5	1	1
HP Graduates (9/05 to 8/06):	5	1	1

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].

RENSSELAER POLYTECHNIC INSTITUTE (continued)

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

	MS
HP Enrollment (Fall 2007):	12
HP Graduates (9/06 to 8/07):	4
HP Graduates (9/05 to 8/06):	6

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.

SAN DIEGO STATE UNIVERSITY (continued)

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

	BS	MS	PhD
HP Enrollment (Fall 2007):	30	18	13
HP Graduates (9/06 to 8/07):	7	5	2
HP Graduates (9/05 to 8/06):	8	6	0

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.

TEXAS A&M UNIVERSITY (continued)

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.

TEXAS A&M UNIVERSITY (continued)

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-ray-induced 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-ray-induced 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.

TEXAS A&M UNIVERSITY (continued)

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) 867-4877 / Fax: (254) 867-3381

Program Director:
David Day
Environmental Health & Safety Technology
3801 Campus Drive
Waco, Texas 76705

HP Degrees Granted:
Associate of Applied Science in EHS with a Health Physics Specialization
Advanced Technical Certificate in Health Physics (ATC)

Remote Delivery of Course: None

	AA
HP Enrollment (Fall 2007):	5
HP Graduates (9/06 to 8/07):	3
HP Graduates (9/05 to 8/06):	7

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

Linda K. Morris, Radiation Safety Officer and Instructor (254-867-2952); M.S. Biophysics (Health Physics) Texas A&M University 1971. [Linda.Morris@tstc.edu]

Other Information
Health physics is a specialization under the umbrella of the Environmental Health & Safety Technology program. Students receive basic training in all aspects of safety (safety compliance, environmental compliance, and health physics), but can then specialize in one of the three areas. Another option for the college graduate in a related field is to obtain an Advanced Technical Certificate in Health Physics (ATC). This is an additional sixteen academic credit hours above the degree. TSTC also has an active Student Branch which also participates in South Texas Chapter-HPS conferences.

17. UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

Department of Preventive Medicine and Biometrics
Telephone: (301) 295-3129/ Fax: (301) 295-6282

Program Director:
Dr. Scott Nemmers
Department of Preventive Medicine and Biometrics
Uniformed Services University of the Health Sciences
4301 Jones Bridge Road
Bethesda, MD 20814
(301) 319-6953
email: snemmers@usuhs.mil
website: http://hp.usuhs.mil/

HP Degrees Granted:
M.S. in Public Health
Ph.D. in Environmental Science

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2007):	1	1
HP Graduates (9/06 to 8/07):	3	0
HP Graduates (9/05 to 8/06):	0	0

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

Scott Nemmers, Assistant Professor, Division of Environmental and Occupational Health (301-319-6970); Ph.D. University of North Dakota, 1993; Medical physics, radiation biology. [snemmers@usuhs.mil]

Paul K. Blake, Assistant Professor, Division of Radiology and Radiological Sciences (301-295-9806); Ph.D. University of Wisconsin-Madison, 1986; Dosimetry, medical physics, and radiation biology. [pblake@usuhs.mil]

Other Faculty

W.P. Roach, Adjunct Professor of Preventive Medicine and Biometrics
W F. Blakely, Assistant Professor of Preventive Medicine and Biometrics
Ted St. John, Adjunct Assistant Professor of Preventive Medicine and Biometrics
David A. Schauer, Adjunct Associate Professor of Radiology and Radiological Sciences
J. L. Crapo, Adjunct Assistant Professor of Preventive Medicine and Biometrics

Sponsored Research Activities in Health Physics (2003 – Present)

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.

Biological Dosimetry
Principal Investigator: William F. Blakely
Agencies: Armed Forces Radiobiology Research Institute, NIAD, TSWG
Type: Research Grant **Period:** 2003 - 2004
The goal of these research grants are to identify, optimize and validate biological dosimetry systems to support medical management for radiation casualties.

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.

	MS	PhD
HP Enrollment (Fall 2007):	2	5
HP Graduates (9/06 to 8/07):	1	1
HP Graduates (9/05 to 8/06):	4	1

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]

UNIVERSITY OF CINCINNATI (Continued)

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.

UNIVERSITY OF CINCINNATI (Continued)

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)

	BS	MS	PhD
HP Enrollment (Fall 2007):	12	3	2
HP Graduates (9/06 to 8/07):	2	1	0
HP Graduates (9/05 to 8/06):	2	2	1

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]

UNIVERSITY OF FLORIDA (continued)

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)*

UNIVERSITY OF FLORIDA (continued)

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

UNIVERSITY OF FLORIDA (continued)

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) 441-0934

Program Director:
Dr. Clayton S. French
Radiological Sciences Program
University of Massachusetts Lowell
1 University Avenue
Lowell, Massachusetts 01854

HP Degrees Granted:
BS in Physics /Radiological Health Physics Option
MS in Radiological Sciences and Protection
PhD in Physics/Radiological Sciences Option
PhD in Biomedical Engineering and Biotechnology - Medical Physics/Radiological Sciences Option

Remote Delivery of Course: None

	BS	MS	PhD
HP Enrollment (Fall 2007):	11	25	22
HP Graduates (9/06 to 8/07):	2	7	0
HP Graduates (9/05 to 8/06):	2	9	3

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, computer applications. [Clayton_French@uml.edu]

Mark A. Tries, Assistant 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.

Other Faculty

James Egan, Professor of Physics, Nuclear Physics Program.
Arthur Mittler, Professor of Physics, Nuclear Physics Program.
Gunter H. R. Kegel, Professor of Physics, Nuclear Physics Program.

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, INPO, NRC, and industry-based research fellowships. A limited number of teaching assistantships are available to qualified students. Scholarships are available to undergraduates and graduates. 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.

Visiting Faculty Financial Assistance

UMass Lowell has no in-place program for supporting visiting faculty. UMass Lowell considers requests for visiting faculty on a case by case basis and may provide financial support or matching funding under certain circumstances.

Student Financial Assistance

UMass Lowell offers a wide variety of financial assistance including scholarships, fellowships, student teaching assistantships, student research assistantships, and work study programs.

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, X-ray facility, and computer room 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.

Professional Certification

Students in Radiological Sciences are encouraged to obtain ABHP certification. In addition to offering an elective graduate course in ABHP Certification 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.

Sponsored Research Activities in Health Physics (2003 - Present)

Digital Neutron Radiography

Principal Investigator: Mark Tries
Agency: Department of Energy
Type: Research **Period:** 2005 – 2006

The goal of this research is to develop a web-based controlled neutron radiography facility at the UML research reactor.

Brachytherapy Design and Characterization

Principal Investigator: David Medich
Agency: Implant Sciences Corp.
Type: Industrial Research **Period:** 2005 – 2006

The goal of this research is to develop new low dose rate brachytherapy sources and perform a dosimetric characterization.

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.

	BS	MS	PhD
HP Enrollment (Fall 2007):	13	10	8
HP Graduates (9/06 to 8/07):	4	6	3
HP Graduates (9/05 to 8/06):	8	6	2

Note: BS numbers are estimates. A student graduates from the Department of Nuclear Engineering and Radiological Sciences using the full title.

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]

UNIVERSITY OF MICHIGAN (continued)

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 non-proliferation 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-temperature-operated, 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

Program Contact:
Dr. Mark A. Prelas
Nuclear Science & Engineering Institute
E2433 Lafferre Hall
University of Missouri-Columbia
Columbia, Missouri 65211
email: PrelasM@missouri.edu

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

	MS	PhD
HP Enrollment (Fall 2007):	5	3
HP Graduates (9/06 to 8/07):	1	0
HP Graduates (9/05 to 8/06):	2	0

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.

Development of an Alpha/Beta/Gamma Phoswich-Based Radiation Detector for Nuclear Waste Stream Cleanup Processes
Principal Investigator: William H. Miller
Agency: US Department of Energy
Type: Nuclear Engineering Education Research (NEER) Grant **Period:** 2001 – 2003
At numerous DOE sites around the nation, facilities are being developed to process wastes that are in storage from past nuclear activities. Through the proposed treatment processes, potential environmental threats can be mitigated and nuclear materials can be concentrated for ultimate disposal. Accurate monitoring of the radioactivity in the waste processing streams must be carefully quantified to insure that radioactivity in effluents are below prescribed levels. To address this need, an innovative, alpha/beta/gamma/neutron radiation detection system is being developed for this radiological engineering application. Simultaneous measurements of all radioactive components can be performed at very low levels through active, electronic discrimination of different types of radiation.

23. UNIVERSITY OF NEVADA LAS VEGAS

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

Chair:
Dr. Steen Madsen
Box 453037
4505 Maryland Parkway
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

	BS	MS
HP Enrollment (Fall 2007):	4	16
HP Graduates (9/06 to 8/07):	2	4
HP Graduates (9/05 to 8/06):	2	4

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.

UNIVERSITY OF NEVADA LAS VEGAS (continued)

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: (865) 974-5048 / Fax: (865) 974-0668

Program Director:
Dr. H.L. Dodds
Department of Nuclear Engineering
The University of Tennessee
Knoxville, Tennessee 37996-2300
email: hdj@utk.edu

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.

	BS	MS	PhD
HP Enrollment (Fall 2007):	10	15	15
HP Graduates (9/06 to 8/07):	10	3	0
HP Graduates (9/05 to 8/06):	10	4	0

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
Iulian 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.

THE UNIVERSITY OF TENNESSEE (continued)

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
Telephone: 615-322-2828/ Fax: 615-343-7263
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

	MS	PhD
HP Enrollment (Fall 2007):	1	0
HP Graduates (9/06 to 8/07):	1	0
HP Graduates (9/05 to 8/06):	0	0

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)

VANDERBILT UNIVERSITY (Continued)

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