THE ANNUAL REPORT OF THE

Nuclear and Radiological Engineering and Medical Physics Programs

2006-2007
Dear Friends,

I am delighted to present the sixth addition of the annual report for the Nuclear and Radiological Engineering and Medical Physics (NRE/MP) Programs. This report covers the 2006-2007 academic year.

It seems that the nuclear renaissance is just around the corner, if not here already. Given the enthusiasm and anticipation for new nuclear reactor orders, student interest in nuclear and radiological engineering continues to grow. We now have 174 undergraduate students and 68 graduate students in the programs. This is an eight percent increase over the fall 2006 enrollment. Because of the enrollment growth and the continued success of the new MP program, we hired four new faculty members in 2007. I am pleased to welcome Drs. Sang Cho, Chaitanya Deo, Bojan Petrovic, and Wilfred van Rooijen to Georgia Tech.

The medical physics program continues to enjoy cooperation from the Emory University Radiation Oncology Department, the Medical College of Georgia (MCG) Radiology Department, and the Memorial Health University Medical Center. I am pleased to welcome the addition of two new adjunct faculty members, Dr. Tom Hu and Dr. Brian Zach Fowler. I would also like to take this opportunity to thank one of our adjunct faculty members, Dr. Rebecca Howell, for her contributions to the MP program and wish her the best on her new job. Rebecca left Emory University to join the University of Texas M. D. Anderson Cancer Center.

After many years of outstanding service and leadership and as Chair of the Woodruff School for 19 years, Dr. Winer has decided to retire. Under his leadership, the mechanical engineering program ascended in ranking to top ten in the country. This is quite an accomplishment! He is also credited with maintaining a healthy program in nuclear engineering despite the downturn in student enrollment and research funding in the 1980s and most of 1990s. Under his leadership, the program was reorganized as an autonomous unit in 2002, and is now one of the largest programs in the country. Ward was also instrumental in the creation and success of the medical physics program. Please join me in congratulating Ward for his outstanding accomplishments and wish him the best on his retirement. We will definitely miss his leadership and support.

Mr. Louis Long (Vice President for Technical Support) recently retired from Southern Nuclear Operating Company. Lou served on the NRE advisory board from fall 2002 through fall 2006. I would like to thank him for his service and dedication to the program and the Woodruff School. He was instrumental in helping the program secure funding from Southern Nuclear for scholarships and to upgrade the radiation physics laboratory. I wish Lou the best on his retirement and look forward to his continued affiliation with the NRE program.

Finally, I am delighted to welcome Dr. Dana Christensen (ORNL), Mr. Jeffrey Gasser of SNOC, and Mr. Joseph DeRoy of Entergy to the advisory board. I look forward to working with them to further advance our programs.

I close by remembering Dr. Melvin Carter who passed away recently after battling with Alzheimer’s disease. More information about Dr. Carter will be found in an accompanying story on page 6 of this report.

I hope that you enjoy reading this report and that you will help us to continue advancing the programs. Please feel free to contact me if you have comments or wish to discuss the programs.

Farzad Rahnema, Professor and Chair
October 2007
Atlanta, Georgia

The annual report of the Nuclear and Radiological Engineering and Medical Physics Programs at Georgia Tech is published in the fall. For more detailed information about Woodruff School undergraduate programs and graduate programs, please contact us by any of the following methods:

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COOKOUTS
In both spring and fall semesters, there was a picnic for all NRE/MP students, faculty, and staff. In addition to the chance for new and returning undergraduate and graduate students to meet each other it is also the opportunity to meet faculty and staff in a relaxed setting. Dr. Ward O. Winer, School Chair, and members of the Woodruff School’s Administrative, Financial, and Student Services offices, who interact frequently with NRE/MP students, attend the event.

SENIORS HONORED AT DINNER
In 2006, ninety-six Woodruff School undergraduate students qualified to attend the annual dinner to honor outstanding seniors and to encourage them to attend graduate school; ten are NRE students. Twelve NRE students qualified for the dinner in 2007. An invitation to the dinner is based on academic record, a grade point average of 3.5 or above. After the buffet dinner, faculty members told short stories or anecdotes about graduate school. The event was also an opportunity for the undergraduate students to interact with some current graduate students and to learn about the different options for study and research at Georgia Tech. Information was provided on admissions, fellowships, and financial aid.

ORIENTATION
In addition to the advising of all undergraduate students through the FASET program, upon matriculation into the graduate program students attend the Woodruff School’s graduate orientation program titled, Getting Started at Georgia Tech, and then attend a program specially designed for NRE/MP students. Information on the degree programs, the curricula, faculty, and student activities are given.

RECRUITING
The Woodruff School has a vigorous program to recruit undergraduate and graduate students to the NRE/MP programs at Georgia Tech. This has paid off in the continued increases in the number of enrollees in the past few academic years. On the undergraduate side, we hold information sessions with the Program Chair for undeclared freshmen in the College of Engineering and the College of Science; go to Connect with Tech and other high school recruiting programs organized by the Institute’s Office of Admissions; and participate in the Georgia Tech Majors Fair.

To encourage students to attend graduate school at Georgia Tech we participate in the Exchange List program, where schools in the United States swap their information for all junior and senior students. In addition, we hold one or two luncheons with selected seniors form Biomedical Engineering, Chemical Engineering, Electrical and Computer Engineering, Mechanical Engineering, Mathematics, and Physics to discuss graduate school opportunities at Georgia Tech in nuclear and radiological engineering and medical physics. We also invite top applicants from other colleges and universities around the country to visit the Georgia Tech campus and meet with NRE/MP faculty; participate in Woodruff School graduate student recruiting events; and attend events such as the Seniors Honors Dinner.

GT AND CLARK ATLANTA UNIVERSITY
The 2006-2007 school year marked the beginning of a nuclear engineering collaboration between the Department of Physics at Clark Atlanta University (CAU) and the NRE program. Several Clark Atlanta students attended the weekly NRE seminar, and we worked on creating a joint 5-year BS/MS program. The first year of the partnership concluded with the NRE program hosting three CAU students during the summer of 2007. The partnership also resulted in attracting a graduate student from CAU into the NRE Ph.D. program. Michael Bellamy, who has a B.S. and an M.S. in physics from CAU, is now a Ph.D. student in NRE. Dr. Nolan Hertel is his advisor.

FAMILY WEEKEND
Each year, Georgia Tech’s Family Weekend attracts large crowds to campus. In conjunction with the activities planned by the Alumni Association, the Woodruff School holds an open house for the families of our undergraduate students. Dr. Dave Sanborn, Associate Chair for Undergraduate Studies, led two information sessions about what the students are being taught in the Woodruff School. A question-and-answer session followed. There were opportunities to talk with the undergraduate academic advisors. The student competition groups displayed their vehicles and robots, and the student chapters of professional societies and the general service groups had display tables.
SCHOLARSHIPS
Many awards recognize academic achievement and outstanding service to the nuclear and radiological engineering program, the Woodruff School, the College of Engineering, and the Institute. Many undergraduate students in the Nuclear and Radiological Engineering Program receive some type of scholarship.

HOPE Scholarships
Almost all of the incoming, in-state students enrolled in the nuclear and radiological engineering program receive HOPE Scholarships, the tuition program financed through the Georgia State Lottery. After the first year at Georgia Tech, approximately fifty percent of the freshman class retain the scholarship. Students need to have a 3.0 grade point average each term to keep the HOPE scholarship.

President’s Scholars
The President’s Scholars Program identifies students who have excelled in academia and leadership in high school. Financial awards are for four academic years, and students are expected to maintain honors-level academic performance and be involved in campus or community activities. Overall, Scholars have a 3.0 GPA. The program is funded entirely by endowments and annual contributions from Georgia Tech’s alumni, industry supporters, and other friends through the Institute’s Roll Call annual giving program. Since the program started in 1981, 1,229 scholars have graduated. Currently, there are 242 President’s Scholars enrolled at Georgia Tech. In fall 2007, there are two new NRE scholars. The scholars in NRE are: Colin Bowers*, Alex Johnson, Caroline Stratton, and Amy Varallo*. [An asterisk indicates a new scholar.]

Women in Engineering Scholarships
The Women in Engineering Program in the College of Engineering is about excellence and leadership. Female undergraduate students qualify for the Excellence Awards banquet by earning an overall GPA of 3.4 or higher. One NRE student, Alice Cheung, received a Boeing corporate scholarship.

Nuclear Engineering Scholarships
Unique scholarship opportunities exist for Georgia Tech undergraduate students in nuclear and radiological engineering. Most scholarships begin in the freshman year and are based on academic achievement. As of fall 2007, 46 NRE undergraduates hold scholarships. Sponsoring organizations and their recipients are: AREVA: Robert Adams, Aaron Clare, Brett Czyzson; AREVA/Department of Energy (DOE): John Schacht; Duke Power: Nathaniel Aligood, Benjamin Beeler, John Bethia, Timothy Flaspoeohier, Stephen Garth, Benjamin Good, David Hartmangruber, David Koch, Nivedh Manohar, Christopher Myers, Caroline Stratton; Duke Power/DOE: Sara Rahnama, Aaron Tubb; McCallum-Turner/DOE: Paul Ferguson, David Nesbitt; McCallum-Turner: Jesse Coyle, Jennifer Farmer, Alex Johnson, Bernard Jones, Kelly Kisling, Jordan Rader, Jackson Renegar, Clifton Robinson, William Shannon; MWH Americas: Lisandro Vazquez, Shruti Vellore; MWH Americas/DOE: Jennifer Farmer; Southern Nuclear: Thomas Batson, Benjamin Bowers, Justin Branley, Timothy Cahill, Robert Espey, Madeleine Phillips, Evan Schwartz, Amy Varallo; Southern Nuclear/DOE: Shane Simpson; Woodruff: Alice Cheung, Samuel Lafountain, Anthony Minarik, Travis Zipperer; Woodruff/DOE: Lloyd Huang, Manan Jani; George W. Woodruff Scholarship (4 years): Kevin Connolly.

FELLOWSHIPS
What follows is a list of the major fellowships held by NRE/MP graduate students from July 1, 2006 to June 30, 2007: Department of Energy: Steven Hamilton, Christopher Sommer; Georgia Tech President’s Fellowship: Steven Hamilton; INPO Fellowship: Charles Becht; National Science Foundation Graduate Research Fellowship: Megan Satterfield; Sandia Fellowship: Jeanne Dion; U.S. Naval Nuclear Propulsion Fellowship: Justin Pounders; Woodruff Fellowship: Steven Douglass, Benoit Forget, Steven Hamilton, Megan Satterfield, Christopher Sommer, Gene Woodruff.

STUDENT GROUPS
There are a number of organizations for NRE/MP students to join. These organizations offer a unique opportunity to learn about the many facets of nuclear and radiological engineering and medical physics, provide an opportunity to meet practicing professionals, and provide valuable service to the program. The following groups are especially for NRE/MP students.

American Nuclear Society: The student section of the American Nuclear Society (ANS) is the link for prospective nuclear engineers with their chosen profession. The section holds monthly meetings which feature presentations by practicing engineers. Dr. Wilfred van Rooijen is the faculty advisor to the student chapter.

Professional Societies
Many professional societies accept students as members. In addition to the American Nuclear Society, which has a Georgia Tech student chapter, NRE/MP students might be interested in:

American Association of Physicists in Medicine: The American Association of Physicists in Medicine (AAPM) is a scientific, educational, and professional organization that promotes the application of physics to medicine and biology, and encourages interest and training in medical physics and related fields. The society publishes a scientific journal called Medical Physics.

Health Physics Society: The Health Physics Society is a scientific professional organization that was founded in 1956 to promote the practice of radiation safety. Activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information.

SEMINARS
Seminars on new developments in nuclear and radiological engineering and medical physics are presented by many well-known speakers throughout the academic year. Speakers come from academia, industry, government organizations, and professional societies, and represent various areas in the disciplines. Graduate students are encouraged to attend these seminars to fulfill the requirements for NRE 8011-2.
**NRE AND MP WILL MOVE TO THE BOGGS BUILDING**
The NRE and MP programs received approval for relocation to the third floor and part of the basement of the Boggs Building. Currently, plans are being developed to prepare these spaces for NRE and MP. The third floor will include spaces for an NRE/MP program administrative suite, faculty offices, research laboratories, a high-speed computing room, the AREVA Radiation Detection Laboratory, the Radiation Therapy Physics Laboratory, and other program facilities. The basement area will include a large experimental research area as well as the Southern Nuclear Radiation Physics Laboratory. The renovation of these new areas for NRE and MP will begin in October 2007. We expect to occupy the Boggs Building space in late 2008. The Gilbert Hillhouse Boggs Building has 153,414 square feet with 87,602 assignable square footage. The building was built in 1970.

**THE RADIATION PHYSICS LABORATORY**
The Southern Nuclear Operating Company, represented by Mr. Jeffery Glasser, Chief Nuclear Officer, donated $135,000 to the NRE program in February 2007. Most of the funding will support the Radiation Physics Laboratory and the remaining funds will be used for graduate fellowships and/or undergraduate scholarships.

The Radiation Physics Laboratory is a senior level laboratory class designed to challenge the student’s theoretical knowledge of radiation physics, radiation detection, and reactor physics concepts through experiments. This class focuses on two types of experiments. In the beginning of the semester, students complete a series of laboratories on a subcritical graphite and natural uranium assembly using radioisotope neutron sources. In these experiments, students can measure basic concepts of nuclear engineering, such as diffusion length and material buckling. During the second part of the course, students conduct reactor based experiments through a videoconferencing setup with the North Carolina State PULSTAR reactor.

The majority of the funding for the Radiation Physics Laboratory will be used to purchase a small sealed tube neutron generator and associated detection equipment to conduct pulsed neutron experiments in the subcritical pile. This new equipment will allow a series of experiments to be introduced to the graduating seniors of the NRE program beginning spring semester 2008. Two of the new experiments introduced will be the measurement of the alpha eigenvalue and the determination of the delayed neutron fraction. The remaining funds will be used to provide additional equipment for existing laboratories to support the growing enrollment in the NRE program.

**SUNRISE, INC.**
A consortium of universities established a not-for-profit company, SUNRISE, Inc. (Southeast Universities Nuclear Reactors Institute for Science and Education) to support the development of the next-generation nuclear workforce, nuclear technology, and advanced research and technical support.

SUNRISE advocates the development of a new research reactor, a training reactor, and supporting laboratory and administrative facilities; and the establishment of a single organization that can be utilized by governmental agencies and the nuclear industry to assist in providing a qualified workforce, to be engaged in nuclear-related research, and to provide technical assistance.

SUNRISE members include eleven universities, four industrial partners and three affiliated members. The universities are: Clemson University, Georgia Tech, Mississippi State, North Carolina State, South Carolina State, University of Florida, University of South Carolina, University of Tennessee, University of South Carolina Aiken, University of Missouri at Rolla, and Virginia Technological Institute. Industrial Partners are AREVA, Fluor-Daniels, General Atomics, and Westinghouse. Affiliated members are Citizens’ for Nuclear Technology Awareness, Economic Development Partnership of Aiken County, and the South Carolina University Research and Education Foundation. Dr. Farzad Rahmna, Chair of the NRE/MP Programs at Georgia Tech, is the Chairman of the SUNRISE board of directors.

**PROGRAMS**

**ACCREDITATION**
Georgia Tech has institutional accreditation from the Southern Association of Colleges and Schools. The Bachelor of Science in Nuclear and Radiological Engineering (BSNRE) degree program is accredited by the Engineering Accreditation Commission of ABET. The Woodruff School will undergo an ABET review of our undergraduate programs in fall 2008. Preparations are well underway for this evaluation. The Georgia Tech Cooperative Program is accredited by the Accreditation Council for Cooperative Education.

**THE UNDERGRADUATE DEGREE PROGRAM**
The undergraduate program in nuclear and radiological engineering leads to the B.S.N.R.E. degree. The strength of the undergraduate curriculum is its breadth and balance in many of the fundamental areas of nuclear and radiological engineering. The vitality of the undergraduate degree program at Georgia Tech is evidenced by the fact that it is now one of the largest programs in the country, with continued growth in enrollment each year.

**BSNRE PROGRAM EDUCATIONAL OBJECTIVES**
The Bachelor of Science degree program in nuclear and radiological engineering has the following educational objectives. More information about accreditation of our degree programs may be found on www.me.gatech.edu. These objectives reflect the needs of our constituencies and have been reviewed and validated by our constituents:
- To prepare students for successful careers and life-long learning.
- To train students thoroughly in methods of analysis, including the mathematical and computational skills appropriate for engineers to use when solving problems.
- To develop the skills pertinent to the design process, including the students’ ability to formulate problems, to think creatively, to communicate effectively, to synthesize information, and to work collaboratively.
- To teach students to use current experimental and data analysis techniques for engineering application.
- To instill in our students an understanding of their professional and ethical responsibilities.
UNDERGRADUATE ADVISEMENT
There is an Advisement web site to help undergraduate students more easily reach their academic advisors and to help students through the advisement process. View this site at www.nre.gatech.edu (see Undergraduate Programs). All students are encouraged to meet and contact the undergraduate advisor: Camellia Henry advises all undergraduate NRE students.

In addition, an NRE faculty mentor/advisor is assigned to each undergraduate student upon entry to the NRE program. This is in addition to the Woodruff School’s undergraduate academic advisors. The faculty mentor is responsible for course advising, professional development, and assisting the students with career planning and research opportunities.

THE ACADEMIC COMMON MARKET
The Academic Common Market (ACM) provides an exciting opportunity for students from the southeast whose state universities do not offer a bachelor’s degree program in nuclear and radiological engineering. Students accepted to Georgia Tech in the bachelor’s degree program in nuclear and radiological engineering pay in-state (Georgia) tuition and must maintain ACM status through academic achievement. Students who are legal residents of Alabama, Arkansas, Kentucky, Louisiana, Maryland, Mississippi, Oklahoma, South Carolina, Virginia, and West Virginia are eligible for this program. The financial benefits that result from the ACM program has proved to be a very successful recruiting tool for the NRE program at Georgia Tech; it helps us attract excellent, out-of-state students.

THE UNDERGRADUATE COOPERATIVE PROGRAM
Since 1912, Georgia Tech has offered a five-year undergraduate cooperative program to those students who wish to combine career-related experience with classroom studies. The program is the fourth oldest of its kind in the world and the largest optional co-op program in the country. Students alternate between industrial assignments and classroom studies until they complete four or five semesters of work. They complete the same course work on campus that is completed by regular four-year students. The program is designed to be started during a student’s freshman and sophomore year.

Students who participate in the program have the opportunity to develop career interests, become more confident in their career choices, and develop human relationship skills through their work experience. Graduates of the program receive a bachelor’s degree with a Cooperative Plan designation. In 2006, 2937 Georgia Tech undergraduates were enrolled in the program and 303 degrees were awarded.

Seventy-one NRE students participated in the co-op program: In summer 2006, there were 11 co-ops, in fall 2006, there were 30 co-ops, and in spring 2007, there were 30 co-ops from the Woodruff School. One student graduated in the past academic year with the Cooperative Plan designation on the B.S.N.R.E. degree.

THE UNDERGRADUATE PROFESSIONAL INTERNSHIP PROGRAM
The Undergraduate Professional Internship Program is geared toward students who do not participate in the Cooperative Program, but want some career-related experience before graduation, typically juniors and seniors. In the past academic year, four NRE students participated in the program. Students generally work for one semester with an option for more work. They must have completed at least thirty hours of academic course work at Georgia Tech before they can participate in the program. NRE students worked at City of Hampton Department of Public Works, Idaho National Laboratory, Oak Ridge National Laboratory, and the Southern Company.

STUDY-ABROAD PROGRAMS
Georgia Tech strongly believes in the importance of an international experience for students. In the past academic year, seven NRE students participated in summer abroad programs: Amanda Bryson was on the Brussels Summer Program; Benjamin Beeler, Sarah Brashear, and Brian Norman went to France for the Georgia Tech Lorraine Undergraduate Summer Program; Albert Yu went to China for the Shanghai Summer Program; Brian Hales did the Japanese LBAT Program; and Robert Adams did a Non-GT Program. In summer 2007, Kelly Kisling participated in the GTL Undergraduate Summer Program, Preston Murray went to England for the Oxford Summer Program, and Shruti Vellore went to Australia for the Sydney Summer Program (Exchange Program).

UNDERGRADUATE RESEARCH
Georgia Tech encourages undergraduate students to participate in quality and substantive research. There are several options in the Woodruff School for a Special Problems Course or an Undergraduate Research Course. NRE 4903 is a non-research special problem. It is usually a design course and may be combined with the capstone design class for a two-semester design problem. NRE 4699 is the undergraduate research course for juniors and seniors and qualifies as an elective for NRE majors. NRE 4698 is for research internships, where students are paid for working on a project either part-time or full-time. Each course requires a written final report and that the student work with a faculty member.

In the past academic year, students did undergraduate research/special problems: Four NRE students took NRE 4699 for credit, and one student took NRE 4698 for pay. One student took NRE 4903.

Three NRE students received President’s Undergraduate Research Awards (PURA). PURA funds requests by a student/faculty team to support undergraduate student involvement in faculty research. The awards are for student salaries and travel expenses for the student to attend professional meetings to give presentations. Students who received PURA funds in the past academic year are: Amanda Bryson, Sara Rahnema, and James Weathers.
THE FIVE-YEAR BS/MS PROGRAM
Outstanding sophomores and early juniors in the Woodruff School are invited to apply to the Five-Year BS/MS Degree Program. Students can earn two degrees in a five-year period, which provides a tremendous advantage when entering the job market. Students can earn undergraduate degrees in mechanical engineering or nuclear and radiological engineering and the master’s degree in ME, NRE, medical physics, bioengineering, or paper science engineering. The program is individualized with numerous opportunities for faculty and students to interact, including mentoring and undergraduate research. Graduate course work begins in the senior year. Most of the master’s students do a course work only program (nonthesis option). Dr. Farzad Rahnema advises BS/MS students once they have matriculated into the graduate program.

In the past academic year, five students were accepted into the BS/MS program in a future term (currently through fall 2010). Currently, there are twenty (13 NRE/NRE, 6 NRE/MP, 1 ME/MP) students: Robert Adams, Sarah Brashear, Alexander Chao, Alice Cheung, Emily Colvin, Kevin Connolly, Stephen Garth, Benjamin Good, David Hartmangruber, Kelly Kisling, David Koch, Alexander Lynn, Miri Pathak, Jordan Rader, Sara Rahnama, Jackson Renegar, Shane Simpson, Caroline Stratton, Shruti Vellore, and Travis Zipperer.

Five students received their master's degree in the past academic year: Obert Chen (NRE/MP, Daniel Hyer (ME/MP), Perry Johnson (NRE/MP), Brian Lockwood (ME/NRE), and James Weathers (NRE/ME).

THE GRADUATE PROGRAM
The Woodruff School has an excellent graduate program that encompasses advanced study and research in the major aspects of nuclear and radiological engineering and medical physics. The master’s degrees are the Master of Science in Nuclear Engineering (MSNE), the Master of Science in Medical Physics (MSMP), and the undesignated Master of Science (M.S.). In addition, the Ph.D. can be obtained in nuclear and radiological engineering or in medical physics as an option within the nuclear engineering program.

THE MEDICAL PHYSICS PROGRAM
The medical physics program began in fall 2004 and offers a Master of Science degree in medical physics and a Ph.D. degree as an option under nuclear engineering. Georgia Tech and Emory University signed a 5-year Memorandum of Understanding (MOU) for the medical physics program in August 2006. Per this agreement, Emory faculty teach 1.25 MP courses at Georgia Tech in addition to providing 400 hours of clinical experience to ten medical physics students each summer at the Emory’s facilities. Three Emory faculty members (Drs. Eric Elder, Zach Fowler, and Tim Fox) hold adjunct appointments in summer at the Emory’s facilities. The MP program by teaching the Nuclear Medicine course (MP 6101) via satellite transmission each fall semester. The MP program has two adjunct faculty members from the Radiology Department (Drs. Z. J. Cao and Tom Hu) who teach this course and supervise and support doctoral students on sponsored research.

Memorial Health University Medical Center in Savannah, Georgia provides 400 hours of clinical experience to three MP students at the Curtis and Elizabeth Anderson Cancer Institute each summer. This program is under the supervision of Director of Medical Physics Dr. Nasser Maleki, who also holds an adjunct appointment in the MP program. He also supervises a Ph.D. student working at the Cancer Care Institute of Carolina at Aiken Regional Medical Centers.

MEDICAL PHYSICS BY DISTANCE
The Woodruff School offers the master’s degree in medical physics as part of its distance-learning program. The admission requirements, courses, and the degree received are the same as for on-campus students. Seven courses for the medical physics degree were offered in fall and spring terms; three (clinical rotation) were offered in the summer term. In fall 2007, there are sixteen medical physics students enrolled in distance learning classes. Medical physics students in the distance program pursue a three-year course work only (no thesis) curriculum.

REMOTE CLINICAL FACILITIES
Associated with the medical physics program is 400 hours of clinical rotation. The following remote clinical facilities have been approved by Georgia Tech for distance learning students in the medical physics program:
- Athens Regional Medical Center, Athens, Georgia
- Alliance Medical Physics, LLC, Alpharetta, Georgia
- Cooper Health System, Camden, New Jersey
- Intermountain Radiation Therapy and LDS Hospital, Salt Lake City, Utah
- Jablonski Physics Services, Inc.: St. Elizabeth Regional Medical Center, Lincoln, Nebraska
- Maryland Regional Cancer Center, Silver Springs, Maryland
- McComas Enterprises, Inc., Gloucester, Virginia
- Medical Physics Consultants, Arlington, Texas
- Northeast Georgia Health Systems, Gainesville, Georgia
- Northside Hospital, Atlanta, Georgia
- Samartan Health Services, Corvallis, Oregon
- Satilla Regional Cancer Treatment Center, Waycross, Georgia
- University of Pittsburgh Medical Center - St. Margaret Radiology Department, Pittsburgh, Pennsylvania

Clinical rotation program at Memorial Health in Savannah, Georgia: (l-r): David Weems, MD, Radiation Oncologist; Nasser Maleki, Ph.D., Director Medical Physics; Gina Dickerson, CMD, Dosimetrist; Jason Savarese, MP student; Mark Boudreaux, MP student (back row): John Duttenhaver, MD, Radiation Oncologist; Dan Hyer, MP student; Chante’ Singleton, MS, Medical Physicist; William Shay, CMD, Dosimetrist.
WE REMEMBER: DR. MELVIN CARTER

Neely Professor Emeritus Melvin W. Carter passed away in August 2007. He joined the Nuclear Engineering/Health Physics faculty in 1972, after a twenty-two year career at the U.S. Public Health Service. Upon his retirement from Georgia Tech in June 1988, he consulted in the area of international radiation procedures.

Carter received a B.S. in civil engineering in 1949, and an M.S. in public health engineering in 1951, both from Georgia Tech. He received a Ph.D. in radiological and environmental engineering from the University of Florida in 1960.

He was appointed by President Ronald Regan to serve a four-year term on the U.S. Nuclear Waste Technical Review Board. In 1998 he was elected to Georgia Tech's Engineering Hall of Fame, and in 1999 he was elected to the National Academy of Engineering “for leadership and teaching in radiation protection, health physics, and public health standards and practices.”

MEET THE NEW DIRECTOR OF DEVELOPMENT

“Development continues to provide the vital margins to allow the Woodruff School to do an even better job in educating students and advancing the knowledge base. I feel very fortunate to be able to work with some of the great minds in ME and NE to make the Woodruff School even better,” said Tom Lawley, who came to the Woodruff School in July 2007 as the new Director of Development.

Tom relocated from Chicago, where he was a Major Gifts Officer with the Children’s Memorial Foundation. He had worked closely with the Children’s Memorial Research Center to raise extramural funding for the physicians and researchers engaged in researching treatments and cures for several debilitating pediatric diseases. He also played an active role in the $400 million capital campaign for the construction of a new hospital in downtown Chicago. Before that, Tom was a Major Gifts Officer with the Atlanta Union Mission, where he helped in the completion of a successful capital campaign. Tom graduated from St. Andrews Presbyterian College in 1995 with a B.A. in History.

Tom’s goals for the Woodruff School include raising funds in support of students and faculty, program enrichment facilities and equipment, and current operational capital as part of the anticipated Capital Campaign. Contact Tom by phone at (404) 385-8345 or by e-mail at tom.lawley@me.gatech.edu.

CONTRIBUTORS

Alumni, Friends and Students
Louis B. Long, PHYS, 1966

Corporations, Foundations and Organizations
Areva NP, Inc.
McCallum-Turner Inc.
Southern Nuclear Operating Company

Faculty and Staff
Farzad Rahnema
Weston M. Stacey, PHYS, 1959

ENROLLMENT

The most important asset in the Woodruff School is our students. Interest and enrollment in the nuclear and radiological engineering undergraduate program continues to surge and we are now one of the largest program in the country. There are 242 students in the NRE/MP program at Georgia Tech: 174 undergraduates, including 42 entering freshmen and four transfer students, and 68 graduate students. By ethnicity, there are 22 Asian, nine Black, three Hispanic, two Multiracial, two Native American, 190 White, and 16 international students.

PROFILES OF INCOMING STUDENTS

Of the 174 undergraduate students, there are 55 freshmen, 46 sophomores, 32 juniors, and 41 seniors. By gender, there are 143 males and 31 females (18%). By ethnicity (American citizens and permanent residents), there are 17 (9.2%) Asian, ten (5.2%) Black, two (1.1%) Hispanic, one (0.6%) Native American, two Multiracial, 143 (82.2%) White, and one (0.6%) international student. By campus, all are in Atlanta.

In fall 2007, the NRE/MP graduate program had a total of 68 graduate students: 43 master’s students (30 MP, 13 NRE) and 25 doctoral students (14 NRE, 11 MP). In the master’s program, there are 28 males and 15 (35%) females and on the doctoral side, there are 19 males and six (24%) females. By ethnicity of the U.S. citizens and permanent residents, there are five (4 MS, 1 Ph.D) Asian, one Hispanic (1 MS), 47 (30 MS, 17 Ph.D) White, and 17 (8 MS, 7 Ph.D.) international students. There are seven Asian (6 MP, 1 NRE), one Native American (MP), 59 White (29 NRE, 30 MP), and 11 International (8 NRE, 3 MP) students.

Entering Freshman Class Profile

There are 42 incoming freshmen students in fall 2007 in the nuclear and radiological engineering program. There are also four students who transferred into the program.

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<td></td>
</tr>
<tr>
<td>Females</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
STUDENTS BY RESIDENCY
Of the 46 entering students, twenty are Georgia residents, and 25 are out-of-state residents. They are from: Alabama (2), Delaware (2), Florida (1), Kansas (1), Kentucky (3), Louisiana (3), Maryland (1), New Hampshire (1), New Mexico (1), Pennsylvania (1), South Carolina (5), Tennessee (1), Texas (1), and Virginia (2). In addition, there is one international student.

GRADE POINT AVERAGE
The average grade point average (GPA) of all nuclear and radiological engineering students is 3.02, with an average of 2.97 for all Woodruff School students in Atlanta. By class, the average GPA’s are: 2.63 for freshmen; 3.02 for sophomores; 3.15 for juniors; and 3.6 for seniors.

Entering Graduate Class Profile

<table>
<thead>
<tr>
<th>Number of Applicants</th>
<th>Nuclear Engineering</th>
<th>Medical Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>39</td>
<td>71</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number Admitted (59% of applicants)</th>
<th>Nuclear Engineering</th>
<th>Medical Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>22</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number Accepted (78% of those admitted)</th>
<th>Nuclear Engineering</th>
<th>Medical Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>11</td>
<td>14</td>
</tr>
</tbody>
</table>

Average GPA for the BS

<table>
<thead>
<tr>
<th>Nuclear Engineering</th>
<th>Medical Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>3.54</td>
</tr>
</tbody>
</table>

Average GRE Scores

<table>
<thead>
<tr>
<th>Verbal (out of 800)</th>
<th>Quantitative (out of 800)</th>
<th>Writing (out of 6.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Engineering</td>
<td>578</td>
<td>775</td>
</tr>
<tr>
<td>Medical Physics</td>
<td>553</td>
<td>742</td>
</tr>
</tbody>
</table>

Demographics

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
<th>Minorities (U.S. citizens)</th>
<th>Internals</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>6</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

*In 1984 the School of Nuclear Engineering became part of the School of Mechanical Engineering. The first degrees in medical physics were awarded in 2005; from that point on, the total is for NRE and MP.

Co-op students are usually excluded from the number of enrolled undergraduates; however at times the numbers were reported with the coops included. There is no way to differentiate and they are just reported as is.

Enrollment in the Nuclear and Radiological Engineering Programs By Degree Level 1985-1986 Through 2007-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergraduates</th>
<th>Graduates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-2008</td>
<td>174</td>
<td>68</td>
<td>242</td>
</tr>
<tr>
<td>2006-2007</td>
<td>151</td>
<td>69</td>
<td>220</td>
</tr>
<tr>
<td>2005-2006</td>
<td>141</td>
<td>74</td>
<td>215</td>
</tr>
<tr>
<td>2004-2005</td>
<td>115</td>
<td>55</td>
<td>170</td>
</tr>
<tr>
<td>2003-2004</td>
<td>95</td>
<td>37</td>
<td>132</td>
</tr>
<tr>
<td>2002-2003</td>
<td>87</td>
<td>44</td>
<td>131</td>
</tr>
<tr>
<td>2001-2002</td>
<td>56</td>
<td>45</td>
<td>101</td>
</tr>
<tr>
<td>2000-2001</td>
<td>35</td>
<td>47</td>
<td>82</td>
</tr>
<tr>
<td>1999-2000</td>
<td>26</td>
<td>45</td>
<td>71</td>
</tr>
<tr>
<td>1998-1999</td>
<td>23</td>
<td>61</td>
<td>84</td>
</tr>
<tr>
<td>1997-1998</td>
<td>26</td>
<td>61</td>
<td>87</td>
</tr>
<tr>
<td>1996-1997</td>
<td>33</td>
<td>78</td>
<td>111</td>
</tr>
<tr>
<td>1995-1996</td>
<td>45</td>
<td>83</td>
<td>128</td>
</tr>
<tr>
<td>1994-1995</td>
<td>59</td>
<td>105</td>
<td>164</td>
</tr>
<tr>
<td>1993-1994</td>
<td>63</td>
<td>117</td>
<td>180</td>
</tr>
<tr>
<td>1992-1993</td>
<td>72</td>
<td>122</td>
<td>194</td>
</tr>
<tr>
<td>1991-1992</td>
<td>72</td>
<td>97</td>
<td>169</td>
</tr>
<tr>
<td>1990-1991</td>
<td>83</td>
<td>89</td>
<td>172</td>
</tr>
<tr>
<td>1989-1990</td>
<td>101</td>
<td>78</td>
<td>179</td>
</tr>
<tr>
<td>1988-1989</td>
<td>111</td>
<td>79</td>
<td>190</td>
</tr>
<tr>
<td>1987-1988</td>
<td>135</td>
<td>74</td>
<td>209</td>
</tr>
<tr>
<td>1986-1987</td>
<td>149</td>
<td>69</td>
<td>218</td>
</tr>
<tr>
<td>1985-1986</td>
<td>139</td>
<td>73</td>
<td>212</td>
</tr>
<tr>
<td>Totals</td>
<td>1991</td>
<td>1670</td>
<td>3661</td>
</tr>
</tbody>
</table>

NRE/MP Program

Enrollment By Major
Fall 2007

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Graduates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Sophomores</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Juniors</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Seniors</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>174</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graduate Students</th>
<th>Undergraduates</th>
<th>Graduates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph.D.’s</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Physics</th>
<th>Undergraduates</th>
<th>Graduates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph.D.’s</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total NRE Students 242
DEGREES

Since the first degree was granted in 1890 through spring 2007, the Institute has awarded 100,902 bachelor’s degrees, 34,789 master’s degrees, and 6,349 doctoral degrees, for a total of 142,040 degrees. The Woodruff School offers five degrees as part of the its Nuclear and Radiological Engineering/Medical Physics Programs: An undergraduate degree in nuclear and radiological engineering (BSNRE) and four graduate degrees, three master’s (M.S., M.S.N.E., M.S.M.P.) and the Ph.D. Students in medical physics can earn their doctoral degree as an option in the nuclear engineering program. In addition, the master’s degree can be completed off-campus through the distance-learning program.

Degrees Awarded in Nuclear and Radiological Engineering in Academic Years 1984-1985 Through 2006-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>BS</th>
<th>MS</th>
<th>Ph.D.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-2007</td>
<td>14</td>
<td>26</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>2005-2006</td>
<td>22</td>
<td>18</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td>2004-2005</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>2003-2004</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2002-2003</td>
<td>7</td>
<td>11</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>2001-2002</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>2000-2001</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>1999-2000</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>1998-1999</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>1997-1998</td>
<td>9</td>
<td>16</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>1996-1997</td>
<td>10</td>
<td>19</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td>1995-1996</td>
<td>13</td>
<td>16</td>
<td>8</td>
<td>37</td>
</tr>
<tr>
<td>1994-1995</td>
<td>8</td>
<td>34</td>
<td>4</td>
<td>46</td>
</tr>
<tr>
<td>1993-1994</td>
<td>12</td>
<td>30</td>
<td>6</td>
<td>48</td>
</tr>
<tr>
<td>1992-1993</td>
<td>7</td>
<td>29</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>1991-1992</td>
<td>7</td>
<td>32</td>
<td>5</td>
<td>44</td>
</tr>
<tr>
<td>1990-1991</td>
<td>14</td>
<td>23</td>
<td>7</td>
<td>44</td>
</tr>
<tr>
<td>1989-1990</td>
<td>21</td>
<td>27</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>1988-1989</td>
<td>15</td>
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<td>3</td>
<td>53</td>
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<td>1987-1988</td>
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<td>1986-1987</td>
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<td>42</td>
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<tr>
<td>1985-1986</td>
<td>41</td>
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<td>78</td>
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<tr>
<td>1984-1985</td>
<td>21</td>
<td>18</td>
<td>2</td>
<td>41</td>
</tr>
<tr>
<td>TOTALS</td>
<td>295</td>
<td>455</td>
<td>95</td>
<td>845</td>
</tr>
</tbody>
</table>

UNDERGRADUATE DEGREES AWARDED

Fourteen bachelor’s degrees were awarded in nuclear and radiological engineering in the past academic year, summer 2006 through spring 2007. By gender, seven were males and seven were females. By ethnicity, all were white.

SUMMER 2006
Jane Wagner

FALL 2006
Sarah Brashear
Eric Bruch
Amanda Bryson
Brittany Meriwether
James Weathers
Frederick Willis

SPRING 2007
Emily Colvin
Jessica Feener
John-Patrick Floyd
Elisabeth Gayton
Franklin Hope
Bernard Jones
Christopher Myers

GRADUATE DEGREES

In the past academic year, there were two master’s in health physics (the last ones to be awarded by the Institute); 15 in medical physics, and nine in nuclear and radiological engineering. By gender, eight degrees went to females in NE/MP and eighteen went to males in ME/MP/HP. Six master’s degrees (5 MP, 1 HP) were awarded to distance learning students in the past academic year:

Of the Ph.D.’s awarded by program, five were in nuclear and radiological engineering. By gender, there were five doctoral degrees in NRE to males. By ethnicity and citizenship, there was one White and four international students.

There were 27 master’s degrees (16 MSMP, 9 MSNE, 2 MSHP). By gender, there were 19 males (11 MSMP, 6 MSNE, 2 MSHP) and eight females (5 MSMP, 2 MSNE,1 MSHP). By ethnicity, there were eight Asians (5 MSMP, 3 MSNE) and 19 Whites (ll MSMP, 7 MSNE, 1 MSHP).

MASTER’S DEGREES (NONTHESIS)

SUMMER 2006
Xiaowan Chen MSMP Georgia Tech
James Cover MSMP Clemson University
Amanda Jackson MSMP Georgia Tech
Steven Jones MSNE Georgia Tech
P. Montanaro MSMP University of Maine
Scott Shields MSMP University of Wisconsin
William Snider MSHP University of Kentucky
Xiaoqin Yang MSMP Tsinghua University
Xiping Zhang MSMP Tsinghua University

FALL 2006
Zubair Abbasi MSHP Mehran University
William Christian MSMP Georgia Tech
Quyen Jones MSMP Portland Community College
Sunil Kavuri MSMP Nagarjuna University

SPRING 2007
Jeanne Dion MSNE University of Texas
Gregory Grennan MSMP University of Tulsa
Edward Hornsmith MSMP Virginia Tech
Robert Kutchi MSMP Bloomsburg University
Joseph Mahoney MSMP Southern Methodist University

MASTER’S DEGREES WITH THESIS

FALL 2006
Zubair Abbasi, M.S.N.E.
Advisor: Nolan Hertel
Title: Identification and Calculation of Activity of Unknown Isotope From Spectral Analysis in a Radiological Dispersion Device (RDD) Incident
Previous School: Mehran University of Engineering & Technology

Ashby Bridges, M.S.N.E.
Advisor: Nolan Hertel
Title: Estimating the Radiation Dose to Emergency Room Personel in an Event of a Radiological Dispersal Device Explosion
Previous School: Georgia Tech

Sharon Chandler, M.S.N.E.
Advisor: Nolan Hertel
Title: Comparison of Reprocessing Methods for Light Water Reactor Fuel
Previous School: Thomas A. Edison State College

UNDERGRADUATE DEGREES

Fourteen bachelor’s degrees were awarded in nuclear and radiological engineering in the past academic year, summer 2006 through spring 2007. By gender, seven were males and seven were females. By ethnicity, all were white.
SAID I. ABDEL-KHALIK, Southern Nuclear Distinguished Professor
Ph.D., University of Wisconsin, 1973
Research: Dr. Abdel-Khalik conducts experimental and numerical research in both mechanical and nuclear engineering. Current experimental research projects include investigation of the root-cause mechanism for axial offset anomaly in pressurized water reactors, single and two-phase flow and heat transfer in microchannels with emphasis on accelerator targets and resistive magnet systems, first wall protection schemes for inertial fusion reactors, EHD enhancement of convection and boiling heat transfer for microgravity applications, and fuel cells' performance enhancement. Current numerical research efforts include multifluid modeling of transient nonequilibrium two-phase flow, Rayleigh-Taylor instability of bounded layers with surface injection, thermal analysis of dry cask spent nuclear fuel storage systems, and density wave instabilities in boiling water reactors.

FACULTY

Dr. Abdel-Khalik, graduate student Joseph Hu, and research engineer Dennis Sadowski discussing an experimental test facility for simulation of boron deposition resulting in axial offset anomalies in pressurized water reactors.

SANG HYUN CHO, Associate Professor
Ph.D., Texas A&M University, 1997
Research: Over the years, Dr. Cho has performed seminal research on radiotherapy-related topics such as Ir-192 dosimetry, beta particle dosimetry, radiotherapy quality assurance (QA), Monte Carlo modeling of medical linear accelerators and brachytherapy sources, and the use of gold nanoparticles for radiation therapy. He continues to have a special interest in the application of the Monte Carlo method to solve the problems related to various radiation treatment modalities such as intensity modulated radiation therapy, image guided radiation therapy, proton therapy, and brachytherapy. In recent years, his research effort has been devoted to the use of gold nanoparticles as dose enhancers for radiotherapy, heat generators for thermal therapy, and imaging agents during pre-clinical molecular imaging. These new cancer treatment modalities are expected to be more powerful but less toxic than conventional radiation/thermal therapy. In addition to his therapy-related research, Dr. Cho’s research group at Georgia Tech currently performs an investigation on nanoparticle-aided cancer molecular imaging.
NOLAN E. HERTEL, Professor
Ph.D., University of Illinois, 1979
Research: Dr. Hertel is involved in the determination of internal contamination levels in individuals following a radiological dispersion device event using handheld field instruments. This is work is being funded by the CDC Radiation Studies Branch. Dr. Hertel is also involved in the measurement of neutron fields and doses in the vicinity of accelerator-based medical facilities, research reactors, and other neutron sources. In recent years, he has been involved in the determination of activation product inventories in reactors in support of decommissioning activities and waste disposal. He is also involved in the development of algorithms to increase the utility of detectors being used in portal monitors for homeland security and nuclear materials safeguards activities. In addition, he has continued activities in radiation shielding and radiation skyshine, as well as in computational dosimetry topics including the creation of dose conversion coefficients for use in external radiation protection. Dr. Hertel is a senior fellow in the Sam Nunn Security Program at the University of Texas at Austin.

BOJAN PETROVIC, Professor
Ph.D., Pennsylvania State University, 1995
Research: Dr. Petrovic’s current research focuses on advanced reactor design. Specifically, over the past eight years, he has been involved in the development of the International Reactor Innovative and Secure (IRIS), within an international team of 19 organizations from ten countries.

Another aspect of Dr. Petrovic’s research focuses on methods development in reactor physics and transport theory. Novel reactor designs pose new challenges to analytic tools and thus require improved, more accurate methods. Dr. Petrovic’s interest is in developing approaches for using Monte Carlo and hybrid deterministic-Monte Carlo methods in a way that will be practical and relevant for analysis of large, real-life applications.

Dr. Petrovic has strong interest in interdisciplinary areas, and his research projects have included collaboration related to industrial and medical applications of nuclear technology.

CHAITANYA S. DEO, Assistant Professor
Ph.D., University of Michigan, 2003
Research: Nuclear energy has a strong role to play in satisfying future energy security and environmental quality needs of the United States and the world. Materials issues are at the forefront. Deo’s research combines computational materials science with advanced analytical experimental techniques in a multiscale and multidisciplinary approach to investigate materials performance in extreme environments.

Our approach in studying nuclear engineering materials connects the atomic structure to macroscopic properties and the relevant environment/processing parameters (temperature, pressure, radiation dose, etc.). First principles calculations, in which properties are derived from quantum mechanics, will be utilized to obtain thermodynamic and kinetic information of materials behavior. The translation of this atomistic information to the study of non-equilibrium and phenomena involves models and methods that span several length and time scales. Computational techniques based on statistical mechanics and continuum mechanics will be utilized.

WESTON M. STACEY, JR., Fuller E. Callaway Professor in Nuclear Engineering and Regents’ Professor
Ph.D., MIT, 1966
Research: Dr. Stacey’s research has two principal thrusts. Experimental Plasma Physics Analysis and Supporting Theory: Dr. Stacey’s group in the Fusion Research Center (FRC) formally collaborates with the DIII-D National Fusion Facility in the planning, data analysis, and interpretation of plasma physics experiments in the DIII-D tokamak, formally collaborates with the German TEXTOR tokamak group in the analysis of a series of experiments, and independently carried out supporting plasma theory and code development. This work has concentrated on understanding density limits, calculating plasma rotation and transport, and understanding phenomena in the edge plasma which play a major role in plasma confinement. This analysis is supported by an active theoretical development activity. Advanced Nuclear Systems Design: Dr. Stacey’s student-faculty design projects have developed in a series of design studies the concept of a subcritical transmutation, driven by a fusion neutron source, which would transmute the long-lived actinides in spent nuclear fuel.
W. F. G. VAN ROOIJEN, Assistant Professor of Radiation Engineering, The Netherlands, 2006
Research: Dr. van Rooijen’s research focuses on two intimately connected subjects: Nuclear fuel cycle and transmutation studies on the one hand, and the design of fast reactors on the other hand. Nuclear power has an enormous potential as an energy source free of greenhouse gas emissions. Nuclear fuel cycle and transmutation studies seek to minimize the amount of radiotoxic test materials resulting from the application of nuclear energy, and to maximize the utilization of the resources of nuclear fuel. Both tasks require a special type of reactor, a so-called Fast Reactor, which will also be researched. Thus, the transmutation studies are intimately linked to the design of the machines to safely perform the transmutation task. The ultimate goal of the research is to establish the Nuclear and Radiological Engineering program as one of the leading labs in the field of fuel cycle physics, transmutation studies, and fast reactor design.

C.-K. CHRIS WANG, Associate Professor of Radiation Engineering, Ph.D., Ohio State University, 1989
Research: Dr. Wang recently developed a nanodosimetry-based biophysical model for predicting survival fractions of cells that have been irradiated with various types of ionizing radiation. This model is being fine-tuned to make it applicable to radiation therapy modalities using neutrons and carbon ions. Dr. Wang continues his long-term effort on Cf-252 neutron brachytherapy (NBT) for treating radioresistant tumors. He recently developed a dosimetry protocol, which is to be used to calibrate the new-generation Cf-252 NBT sources in a water phantom for their neutron and gamma-ray dose distributions. Dr. Wang has also been working on a new type of neutron detector that employs gas electron multipliers. This new detector has a plate-like geometry as opposed to the traditional cylindrical or spherical geometry. As such, applications of the detector are being proposed for radiation protection and homeland security.

AFFILIATED FACULTY

SRI NIVAS GARIMELLA, Professor of Radiation Engineering, Ph.D., Ohio State University, 1990
Research descriptors: Sustainable technologies, phase change in microchannel and compact heat exchangers, and heat and mass transfer in binary mixtures.

S. MOSTA FA GHA ASIAAN, Professor of Radiation Engineering, Ph.D., UCLA, 1983
Research descriptors: Multiphase flow, aerosol and particle transport, microscale heat transfer, and nuclear reactor thermohydraulics.

SHELD ON JETER, Associate Professor of Radiation Engineering, Ph.D., Georgia Institute of Technology, 1979
Research descriptors: Thermodynamics, energy systems, and heat transfer.
**Transport in stochastic media, and direct and inverse methods in reactor physics**

**Research Engineer II and Interim Manager of the NRE/MP Laboratories**

**Research:** Using noninvasive Magnetic Resonance Imaging (MRI) techniques, our laboratory has shown that myocardial calcium homeostasis modulation can be detected noninvasively. This calcium homeostasis modulation is correlated with myocardial ischemic-reperfusion. Since myocardial ischemia appears to have significant negative effects both on acute and chronic cardiac remodeling and end-organs, our laboratory is interested in non-invasively evaluated patho-physiological changes in cardiovascular tissues, in order that effective prevention and treatment strategies can be implemented early on to minimize or reverse myocardial damage. Our experimental approaches are two fold: quantitate myocardial injury and cellular infiltration due to inflammatory processes; and correlate local calcium homeostasis directly with adverse local contractile function.

**Research:** Dr. Nasser Maleki’s research interest is in the area of Internal Organ Motion during Radiation Treatment. The field of Image Guided Radiation Therapy (IGRT) is relatively new and organ motion during treatment and on a daily basis is one of the most challenging problems in treatment optimization. Dr. Maleki is actively exploring the application of implantable passive and active markers, RF transmitter or magnetic, for organ motion detection. He is also active in development of modern quality management techniques in radiation therapy.

**Adjunct NRE Faculty**

**Richard Sanchez,** Adjunct Professor
Research Director, CEA, France
Ph.D., University of Paris, France, 1979
Research: Dr. Richard Sanchez’ research focuses on the hybrid diffusion/coarse mesh transport method for Pebble Bed Reactors. His current research focuses on the hybrid diffusion/coarse mesh transport method for Pebble Bed Reactors.

**Dingkang Zhang,** Postdoctoral Fellow and Student Recruiting Coordinator
Ph.D., Georgia Institute of Technology, 2005
Research: Dr. Zhang’s research centers on the development of radiation transport methods for neutronics analyses in reactor cores. His current research focuses on the hybrid diffusion/coarse mesh transport method for Pebble Bed Reactors. He is also interested in the development of coupled photon/electron transport methods for dose estimation in medical physics applications.

**Emeritus Faculty**

Joseph D. Clement, started in 1965, retired in 1991
Monte V. Davis, started in 1973, retired in 1987
Geoffrey G. Eichholz, started in 1963, retired in 1988
Bernd Kahn, started in 1974, retired in 1996
Ratib Karam, started in 1972, retired in 1997
Alfred Schneider, started in 1975, retired in 1990

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A Brief History of Nuclear Engineering at Georgia Tech

- **1885**: The Georgia Legislature passes a bill appropriating $65,000 to found a technical school.
- **1886**: Atlanta is chosen as the location for the Georgia School of Technology.
- **1888**: Georgia Tech opens for classes on October 8 with 129 students working toward the only degree offered, the Bachelor of Science in Mechanical Engineering.
- **1931**: The Georgia Legislature creates the University System of Georgia.
- **1948**: The Board of Regents authorizes Tech to change its name to the Georgia Institute of Technology.
- **1957**: Frank Neely helps Georgia Tech get one of the first nuclear reactors in the South. The Georgia Legislature grants Tech $2.5 million for a nuclear reactor. The cost for the entire complex was 4.5 million dollars.
- **1958**: The first master’s degree in Nuclear Science is granted. This would later become the Health Physics degree.
- **1960**: The Board of Regents names the research facility that contains the reactor the Frank H. Neely Nuclear Research Center.
- **1962**: The School of Nuclear Engineering is established with the M.S.N.E. as its first degree.
- **1963**: Dr. Geoffrey Eicholtz is the first faculty member hired in the School of Nuclear Engineering. The first MSNE is awarded to a minority student.
- **1964**: The heavy-water-cooled nuclear reactor begins operations. The Ph.D. in nuclear engineering is approved.
- **1965**: The first Ph.D. in nuclear engineering is awarded to Walter Waverly Graham. The curriculum option of health physics within the MSNE program is initiated.
- **1966**: The undergraduate program in Nuclear Engineering is established.
- **1972**: The first master’s degree in nuclear engineering is awarded to a minority student. The Board of Regents approves the conversion of the master’s degree in applied nuclear science to be conferred on health physics students in the nuclear engineering department. This will be called the M.S. in Health Physics.
- **1973**: The bachelor’s degree in nuclear engineering is approved.
- **1975**: The master’s degree in nuclear engineering is accredited. The first master’s degree in nuclear engineering is awarded to a female student.

Mid-1970s Tech is one of the first undergraduate programs in nuclear engineering to be accredited.

- **1977**: The Center of Radiological Research is formed to coordinate research in health physics. The distance-learning (video) program in health physics (M.S.H.P.) and nuclear engineering (M.S.N.E.) is started.
- **1979**: The School of Nuclear Engineering is renamed the School of Nuclear Engineering and Health Physics.

Late 1970s Tech has the largest graduate health physics program in the country.

- **1981**: The first Ph.D. in nuclear engineering is awarded to a minority student.
- **1984**: The first Ph.D. in nuclear engineering (HP) is awarded to a woman. The School of Nuclear Engineering is merged into the George W. Woodruff School of Mechanical Engineering.

1985: Tech decides to maintain its nuclear engineering program during a period of downturn because nuclear power and security are important to the economies of the southeast and the nation.

Late 1980s Tech still has one of the largest health physics programs in the country.

- **1995**: The nuclear reactor is shut down.
- **1997**: The B.S.N.E. degree becomes the B.S.N.R.E. degree to reflect the addition of radiological engineering courses in the curriculum.

2000: The Nuclear and Radiological Engineering Program joins the Academic Common Market for undergraduate students wishing to get a BS/MS.

2002: Decommissioning the nuclear reactor is completed. The NRE/HP program becomes an autonomous unit in the Woodruff School. A Woodruff School Associate Chair is appointed for the program.

2003: ABET approval of the undergraduate program. The Master’s Degree in Medical Physics receives approval from the Board of Regents.

2004: Students are admitted to the Medical Physics program, which begins in the fall. The distance-learning program in Medical Physics begins. The undergraduate program in nuclear and radiological engineering is ranked 11th in the nation by U.S. News & World Report.

2005: The first three students finished the MSMP program.

2006: The nuclear reactor is torn down to make way for a nanotechnology center.

2007: Because of increased enrollment, four faculty members are hired.