

LSU / MBPCC MEDICAL PHYSICS NEWS

Newsletter of The LSU/MBPCC Medical Physics & Health Physics Graduate Education Program

LSU

College of
Science
Department of Physics
& Astronomy

 **MARY BIRD PERKINS**
CANCER CENTER

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Volume 2, No. 2

Notables

Advanced MRI class offered for the first time.

This course provided knowledge of the principles and practice of Magnetic Resonance Imaging. Participants have been introduced to the underlying MRI physics using visual descriptions, concepts and mathematical models.

Inaugural meeting of Advanced Imaging Working Group:

Monday, November 23, 2015, was the inaugural meeting of the Advanced Imaging Working Group (AIWG), held at Pennington Biomedical Research Center. Organized by Mike Mathis (LSU-BR School of Veterinary Medicine), Owen Carmichael (Pennington Biomedical Research Center), and Les Butler and Kip Matthews (LSU-BR College of Science), the goal of the AIWG is to increase awareness of and access to imaging- and visualization-related resources by researchers in the Baton Rouge area, to foster collaboration among these researchers, and to facilitate research funding proposals to enhance LSU-BR and PBRC research. The inaugural meeting was a meet-and-greet, bringing together 45 faculty from 16 departments and research units at the two institutions.

Looking Back on 2015

Looking back on 2015, our team has accomplished many things. Among them, I would have to say I am most impressed by our students. They performed well in their courses, board exams, research projects, and many are authoring journal articles and submitting grant proposals. Their accomplishments reflect, in my view, a consequence of a very selective admissions process, the hard work by the students, and the dedication of our faculty to teaching, learning, and mentoring students in research.

Applications for admission to the medical physics and health physics graduate program continued to outpace acceptance rates by about 10 to one. Our program continued to achieve a 100% placement rate of graduates; all MS and PhD graduates who sought residency training were accepted into an accredited program. Our trainees are in high demand across the country.

2015 was another record year for our program in research: 23 grants were active or pending, and 26 papers were accepted or published by peer reviewed journals. This growth in research productivity reflects well on our faculty and students. We are grateful to LSU, Mary Bird Perkins Cancer Center (MBPCC), and our extramural sponsors for their support of the program during a difficult economic period for our nation's higher education system.

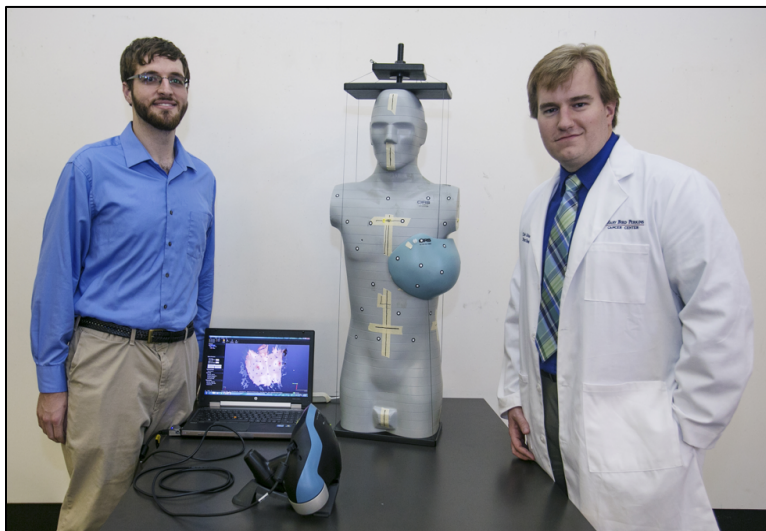
Looking forward to 2016, we foresee sustained research productivity and, with a little luck, increased extramural funding to further expand research and education opportunities for our trainees and faculty.

Nationally and in Louisiana, an increasing proportion of the cost of higher education is shifting from the states to students, their families, and universities. This means that supporting your *alma mater* has never been more important than in 2016. Please see the feature story on one of our philanthropic initiatives and learn how your contribution, however large or small, can make an important difference in the training of a graduate student.

Enjoy the newsletter and stay in touch!

Wayne Newhauser, Program Director

The Right Place



LSU Medical Physics PhD students William Donahue and Chris Schneider with anthropomorphic phantom.

Dr. Wayne Newhauser, Dr. Charles M. Smith Chair in Medical Physics, and a team of graduate students are researching the application of 3-D scanning and printing technologies to improve cancer treatments.

“Radiotherapy is used for many breast cancer patients. The effectiveness of controlling the primary tumor is already pretty good, with about 80 percent of patients surviving long-term. But drugs, radiation and surgery each damage surrounding tissue. We’d like to minimize that damage as much as we can,” Dr. Newhauser shared.

Dr. Newhauser and his graduate students want to use 3-D technology to scan patients, create a virtual model of their bodies, and print a dimensionally and density-accurate phantom. Having this capability will facilitate research that aims to take into account each patient’s unique anatomy for a personalized approach to treatment.

Vincent Cellucci, the Communication across the Curriculum (or CxC) Studio coordinator in the College of Art + Design, teamed up with Dr. Newhauser for the project. He predicts that, in the near future, 3-D technology will transform virtually every industry, which is why the research project is a collaboration of several units across campus.

“LSU is a community. Not only do we work with each other, we know each other. The team working on this project includes faculty members from LSU Physics; Art + Design; Textiles, Apparel & Merchandising; as well as a partnership with Pennington and MBPCC. To be able to form such a diverse interdisciplinary team in one’s own community

isn’t an opportunity that happens every day or overnight, but the willingness of the LSU community to collaborate makes it easy for us to reach out to each other and form mutually beneficial partnerships,” Cellucci said.

Dr. Charles Smith, a graduate of the LSU School of Medicine and a donor to the Medical Physics & Health Physics Program, credits medical physics with prolonging his own life after a battle with cancer. The Medical Physics Program is a partnership operated by LSU and Mary Bird Perkins Cancer Center.

“I know that everyone hopes to find a cure for cancer, but I wish more people would recognize the importance of medical physics training in oncology. Keeping that training in our area will provide the best treatment for patients, so they won’t have to travel far away from home to get the same results,” Dr. Smith said.

Trey and Kim Bowman, who founded the Bella Bowman Foundation in memory of their daughter, also give to the program. They work with Dr. Newhauser and Mary Bird Perkins Cancer Center to research brain stem necrosis, the rare side effect of proton radiation therapy that Bella experienced.

“If we could develop a test to see how a child’s genetic makeup will respond to treatment, that would be huge. Bella may still be here today if we had that,” Kim said, continuing, “We feel like our child is a stepping stone to get to a time where other children may not lose their lives. Through this research, we can help save a child’s life or prevent the adverse side effects of treatment.”

Dr. Newhauser asserts that Baton Rouge is the right place for these projects to take place. “The right resources are here, the right people are here, and the societal need for new and better care is here. LSU’s leadership is increasing its emphasis on biomedical research to stimulate more of this activity,” he said, adding, “It’s a very worthy cause.”

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http://issuu.com/lisufoundation/docs/cornerstone_w15s16

Article by Jennie Gutierrez, LSU Foundation

To support the LSU Medical Physics Program, visit www.LSUFoundation.org

Medical Physics Program in the News

Featured article on MedicalPhysicsWeb and in article by Freeman T, "The physics of proton therapy." Article about review paper of same name by Wayne D Newhauser and Rui Zhang, published in Phys. Med. Biol. 60 R155, Mar 30, 2015. <http://medicalphysicsweb.org/cws/article/journals/60680>

Cancer Prevention Workforce Supplement, Workforce Gaps and Opportunities in Cancer Prevention and Control: Meeting the Challenge. University of Texas MD Anderson Cancer Center, 2015
<http://www.mdanderson.org/education-and-research/education-and-training/schools-and-programs/research-training/programs-and-courses/cancer-prevention-research-training-program/trainee-resources/cancer-prevention-workforce-supplement.html>

Featured article on MedicalPhysicsWeb and in article by Freeman T, "Simulations assess carbon ion beam tracking," Eley et al. Robustness of target dose coverage to motion uncertainties for scanned carbon ion beam tracking therapy of moving tumors. Phys. Med. Biol. 60:1717-2240, 2015
<http://iopscience.iop.org/article/10.1088/0031-9155/60/8/R155>

"Research, PMB: the top ten of 2015. Story on Physics in Medicine and Biology's top 10 downloaded papers of 2015". <http://medicalphysicsweb.org/cws/article/research/63565>, Dec 21, 2015, regarding "The physics of proton therapy" by Wayne D Newhauser and Rui Zhang, published in Phys. Med. Biol. 60 R155, Mar 30, 2015. <http://iopscience.iop.org/article/10.1088/0031-9155/60/8/R155>. 8345 downloads.

"The Right Place" Fall 2015, LSU Cornerstone Magazine, page 7,
<http://www.phys.lsu.edu/newwebsite/downloads/Medphysfromcornerstone.pdf>

"University team uses Bella Bowman Foundation funding for cancer research." Reveille, Mar 4, 2015.
http://www.lsureveille.com/daily/university-team-uses-bella-bowman-foundation-funding-for-cancer-research/article_e83047ca-c2c7-11e4-aa9a-6bf5206cef74.html

"Radiation and Pottery?" 6 Oct 2015, LSU College of Art and Design, <http://design.lsu.edu/radiation-and-pottery/>

"LSU students pitch 90-second business ideas for competition" 11 Nov 2015,
http://www.lsureveille.com/daily/lsu-students-pitch--second-business-ideas-for-competition/article_582bede8-88ef-11e5-83d9-cb1a19131213.html

"Breath Hold Technique Enhances Radiation Therapy" The Healthcare Journal of Baton Rouge, May/June 2015. https://www.marybird.org/media/ckfinder/files/BreathHold_HJBR_05-06_2015%281%29.pdf

Honors, Awards and Accolades

Outstanding Faculty Award: **Dr. Kip Matthews**, Annual Physics & Astronomy Awards Ceremony, April 24, 2015.
<http://www.phys.lsu.edu/newwebsite/photogallerynew/awards2015.html>

Outstanding Teaching Assistant: **Joseph Steiner**, Annual Physics & Astronomy Awards Ceremony, April 24, 2015.
<http://www.phys.lsu.edu/newwebsite/photogallerynew/awards2015.html>

4th Annual LSU 90-second Pitch Competition – **Joseph Steiner** awarded 2nd place

Welcome New Trainees!



We welcome incoming medical physics students and researchers

- Addie Barron (Centenary College, Louisiana) – MS candidate
- Elizabeth Hilliard (Rensselaer Polytechnic Inst., New York) – MS candidate
- Michelle Lis (Loyola University, Illinois) – MS candidate
- Suman Shrestha (Tribhuvan University, Nepal) - MS candidate
- Jingzhu Xu (University of Iowa, Iowa) – PhD candidate, working under the supervision of Dr. Joyoni Dey.
- We also extend a warm welcome to health physics student Amin Hamideh, who will be working under the supervision of Dr. Wei-Hsung Wang on an MS Degree, while working in the LSU radiation safety office.
- Jihyung Yoon joined the program as a post-doctoral trainee under the supervision of Dr. Rui Zhang. He will be working on radiotherapy patient outcome research.

Graduates Begin Residency Training Programs

Congratulations to all our medical physics graduates this year.

All of our trainees were placed in oncology physics residency training programs locally and across the nation.

- Runyon “Colie” Wood, MS – University of North Chapel Hill, Carolina, NC
- Hatim Chafi, MS – MBPCC Residency – Baton Rouge, LA
- Ryan Schurr, MS – Scott and White, Temple, TX
- Garrett Pitcher, PhD – UF Health Cancer Center – Orlando, FL
- Nick Petersen – Christiana Care Health System – Newark, Delaware

Congratulations to Andy Halloran, who graduated with an MS Degree in Health Physics. Andy has accepted a position at the State of Washington’s radiation control program.



*Dr. Wayne Newhauser and
Andy Halloran*

Faculty and Student Propose New Endorectal CT Scanner for Imaging the Prostate

Graduate student Joe Steiner and Associate Professors Guang Jia and Kip Matthews have developed a concept to acquire ultra-high-resolution CT images of the prostate. Current prostate imaging techniques are relatively low resolution due to the prostates location deep within the body. Consequently, current prostate cancer screening tests can have up to an 80% false positive rate. A false-positive result means the cancer-free patient must go back to the hospital for more invasive tests, such as biopsies, not to mention unnecessary psychological stress.

Their new approach using endorectal CT (ECT) promises to improve screening tests for prostate cancer by reducing the false positive rate by providing ultra-high resolution images of the prostate. The approach may also find application in Low Dose Rate Brachytherapy, a procedure that places radioactive “seeds” in the prostate to treat prostate cancer. Other possible future applications include imaging of cervical cancers and colorectal cancers.

The new ECT device utilizes robust 3D tomosynthesis image reconstruction software, an accessory for patient positioning, and existing clinical CT scanners. The research team has partnered with XDR Radiography and Mary Bird Perkins Cancer Center to build and test a prototype device. They also have applied for a patent through the LSU Office of Innovation and Technology Commercialization.

Student Research Advances Pelvic MRI

Graduate Student Hatim Chafi, Associate Professor Guang Jia, and coworkers have published a paper in the Journal of Magnetic Resonance Imaging titled "Effect of Parallel Radiofrequency Transmission on Arterial Input Function Selection in Dynamic Contrast-Enhanced 3 Tesla Pelvic MRI." The study evaluates whether parallel radiofrequency transmission (mTX) can improve the symmetry of the left and right femoral arteries in dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) of prostate and bladder cancer. See http://www.phys.lsu.edu/newwebsite/downloads/Jia_JMRI_hatim.pdf for details.

Research Yields New QA Tool for Accelerators

Recently graduated student David McLaughlin, together with Professor Emeritus Ken Hogstrom and others, published a study on the use of a lightweight permanent dipole magnet spectrometer, originally designed for laser plasma research, to measure energy spectra of electron beams used in radiation therapy. Shapes of the energy spectra are important for quality control and for matching beams from different accelerators, as each shape depends on the phase of the RF power recirculated to its standing wave accelerator. Collaborating with Rice University, laser plasma physicists, measurement on matched Elekta accelerators were performed at Mary Bird Perkins Cancer Center. See <http://www.ncbi.nlm.nih.gov/pubmed/26328999> for details.

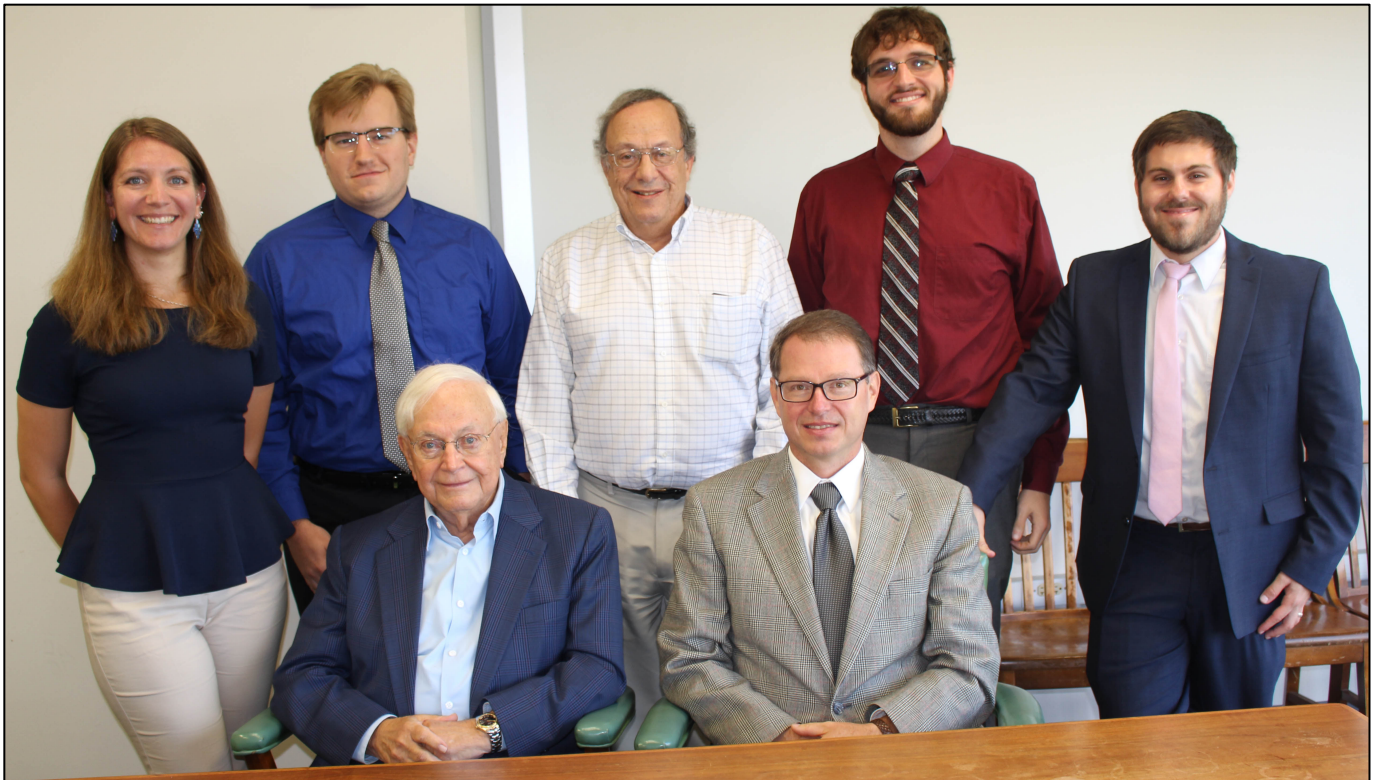
Medical Physicists Study Radiation Necrosis

Radiation therapy is frequently prescribed to attack cancers and can have extremely positive outcomes. In addition to attacking the tumor cells, though, radiation also damages healthy cells, and the injury due to the radiation can also produce life-threatening outcomes. Radiation necrosis is difficult to diagnose and can go undetected on CT scans. Although the cause of this often-deadly side effect is understudied and grossly underfunded, a \$75,000 gift from the Bella Bowman Foundation to the LSU Medical Physics program is supporting research to understand the factors that contribute to radiation injuries to the brain from proton radiotherapy and develop diagnostic and therapeutic approaches to reduce the severity of radiation necrosis and ultimately eliminate occurrences of the rare side effect.

Graduate student Chris Schneider works with Dr. Wayne Newhauser on testing, developing, and refining the radiation dose calculation algorithms — looking at how much radiation treatment is administered by the machine — in both X-ray radiation therapy and proton radiation therapy. Andy Halloran is applying 3-D printing technology to the research by printing what Newhauser calls “plastic phantom” replicas of patients. These phantoms reproduce the anatomical structure of the patient’s disease, so Halloran can test different radiation treatment measurements without harming the actual patient. William Donahue created a prototype database for necrosis cases for his master’s thesis, and is now extending the work for his PhD thesis. Lydia Wilson published a proof-of-concept study with Newhauser in *Phys. of Medicine and Biology* on a novel dose model for radiation cancer therapy. Experimental portions of the work were performed at Mary Bird Perkins Cancer Center. The long-term goal of the study is to enable clinicians to improve outcomes for patients with good prospects for long-term survival, especially to reduce treatment-related side effects.

“We’re simultaneously pushing the frontier of knowledge in several different areas,” said Newhauser, Director of the Medical Physics program operated jointly by LSU and Mary Bird Perkins Cancer Center. “We have very bright young minds who are making a difference through the research they perform as part of their graduate training.”

Additional information about the department’s necrosis research and the Bella Bowman Foundation support can be found in the LSU Reveille article at <http://bit.ly/1EnuUqE>.



*(l-to-r back row) Lydia Jagetic, Chris Schneider, Dr. Michael Cherry, William Donahue, and Andy Halloran
(l-to-r front row) Dr. Charles M. Smith and Dr. Wayne Newhauser*

New Publications in 2015

In 2015, the tireless efforts of faculty and students are reflected by 20 manuscripts that were published or accepted for publication in leading journals. In addition, members of the program published more than 11 abstracts in 2015.

Publications

1. McLaughlin D, Hogstrom K, Carver R, Gibbons J, Shikhaliev P, Matthews II K, Clarke T, Henderson A, Liang E, 2015, Permanent-magnet energy spectrometer for electron beams from radiotherapy accelerators, *Med Phys*, 42, 5517
2. Eley J, Newhauser W, Richter D, Lüchtenborg R, Saito N, Bert C., 2015, Robustness of target dose coverage to motion uncertainties for scanned carbon ion beam tracking therapy of moving tumors, *Phys Med Biol* 60:1717-40
3. Taddei P, Khater N, Zhang R, Geara F, Mahajan A, Jalbout W, Pérez-Andújar A, Youssef B, Newhauser W, 2015, Inter-institutional comparison of personalized risk assessments for second malignant neoplasms for a 13-year-old girl receiving proton versus photon craniospinal irradiation, *Cancers* 7, 407-426
4. Eley J, Newhauser W, Homann K, Howell R, Durante M, Bert C, 2015, Implementation of an analytical model for neutron equivalent dose in a proton radiotherapy treatment planning system, *Cancers* 7, 427-438
5. Rechner L, Zhang R, Eley J, Howell R, Mirkovic D, Newhauser W, 2015, Risk-optimized proton therapy to minimize radiogenic second cancers, *Phys Med Biol*, 60 3999–4013
6. Newhauser W and Zhang R, 2015, The physics of proton therapy, *Phys Med Biol*. 60 R155–R209
7. Freund D, Zhang R, Sanders M, and Newhauser W, 2015, Predictive Risk of Radiation Induced Cerebral Necrosis in Pediatric Brain Cancer Patients after VMAT Versus Proton Therapy, *Cancers*, 7, 617-630
8. Newhauser W, Zhang R, Jones T, Giebeler A, Taddei P, Stewart R, Lee A, Vassiliev O, 2015, Reducing the cost of proton radiation therapy: The feasibility of a streamlined treatment technique for prostate cancer, *Cancers*, 7, 688-705
9. Schneider, C Newhauser W, Farah J, 2015, An analytical model of leakage neutron equivalent dose for passively-scattered proton therapy and validation with measurements. *Cancers* 7, 795-810
10. Jagetic L and Newhauser W, 2015, A simple and fast analytical method to calculate doses to the whole body from external beam, megavoltage x-ray therapy. *Phys Med Biol*. 60 4753–4775
11. Zhang R, Mirkovic D, and Newhauser W, 2015, Visualization of risk of radiogenic second cancer in the organs and tissues of the human body, *Radiat Oncol J* 10 107
12. Newhauser WD, Giebeler A, Zhu R, Titt U, Lee AK, Zhang R, 2015, Uncertainty in dose per monitor unit estimates for passively scattered proton therapy, Part I: The role of compensator and patient scatter in prostate cases, *Proton Therapy Journal*, 1 1
13. Alkhatib H, Gebreamlak W, Tedeschi D, Milhaidis D, Wright B, Neglia W, Sobash P, and Fontenot J, 2015, Output calculation of electron therapy at extended SSD using an improved LBR method, *Medical Physics*, 42(2) 735-40
14. Dey J, Segars W, Pretorius P, and King M, 2015, Effect of Non-Alignment/Alignment of Attenuation Map Without/With Emission Motion Correction in Cardiac SPECT/CT, *IEEE Trans. Nuclear Science*, (62)4 1813-24
15. Rong Y, Evans J, Xu-Welliver M, Pickett C, Jia G, Chen Q, Zuo L, 2015, Dosimetric evaluation of intensity-modulated radiotherapy, volumetric modulated arc therapy, and helical tomotherapy for hippocampal-avoidance whole brain radiotherapy, *PLoS One*. 10(4):e0126222. 34

New Publications continued

16. Heymsfield S, Gonzalez M, Lu JK, Jia G, and Zheng J, 2015, Skeletal Muscle Mass and Quality: Evolution of Modern Measurement Concepts in the Context of Sarcopenia, *Proceedings of the Nutrition Society*. 8:1-12
17. Nguyen H, Jia G, Shah Z, Pohar K, Mortazavi A, Zynger D, Wei L, Yang X, Clark D, and Knopp M, 2015, Prediction of chemotherapeutic response in bladder cancer using k-means clustering of DCE-MRI pharmacokinetic parameters, *Journal of Magnetic Resonance Imaging*, *J Magn Reson Imaging*. 41(5):1374-82
18. Shah Z, Elias S, Abaza R, Zynger D, DeRenne L, Knopp M, Guo B, Schurr R, Heymsfield S, and Jia G, 2015, Performance Comparison of 1.5-T Endorectal Coil MRI with 3.0-T Nonendorectal Coil MRI in Patients with Prostate Cancer, *Academ Radiol*, 22(4):467-74
19. Shumilov D, Heymsfield S, Redman L, Kalluri K, and Dey J, New Compartment Model Analysis of Lean-Mass and Fat-Mass Growth with Overfeeding, *Nutrition* (at press)
20. Newhauser W, Berrington de Gonzalez A, Schulte R, and Lee C, A Review of Radiotherapy-Induced Late Effects Research After Advanced-Technology Treatments. (Invited review), *Frontiers in Oncology*, (accepted)
21. Chafi H, Elias S, Nguyen H, Friel H, Knopp M, Guo B, Heymsfield S, and Jia G, 2015, Effect of Parallel Radiofrequency Transmission on Arterial Input Function Selection in Dynamic Contrast-Enhanced 3 Tesla Pelvic MRI, *Journal of Magnetic Resonance Imaging*, Technical Development, (accepted)
22. Chan C, Dey J, Gobshtein Y, Sinusas A, and Liu C, The Impact of the Dimension of System Matrix and Object Support in Reconstruction for a Stationary Dedicated Cardiac SPECT with Truncated Projections”, *Med Phys* (accepted)
23. Smczynski M, Gifford H, Dey J, Lehovich A, McNamara J, Segars P, and King M, 2015, LROC Investigation of Three Strategies for Reducing the Impact of Respiratory Motion on the Detection of Solitary Pulmonary Nodules in SPECT, *IEEE Trans. Nuclear Science*, (accepted)
24. Xu W, Chafi H, Guo B, Heymsfield S, Murray K, Zheng J, and Jia G, Quantitative Comparison of 2 Dual-Energy X-ray Absorptiometry Systems in Assessing Body Composition and Bone Mineral Measurements, *J Clin Densitometry*, (accepted)
25. Chafi H, Elias S, Nguyen H, Friel H, Knopp M, Guo B, Heymsfield, and Jia G, Effect of parallel radiofrequency transmission on arterial input function selection in dynamic contrast-enhanced 3 Tesla pelvic MRI, *J Magn Reson Imaging*, (Accepted)

Abstracts

1. Rechner L, Zhang R, Eley J, Howell R, Mirkovic D, and Newhauser W, 2015, Minimization of the incidence of radiogenic second cancers with risk-optimized proton therapy, Submitted to Bigart conference in Aarhus, Denmark
2. Vaz P, Kirk B, and Newhauser W, 2015, Radiation Protection and Dosimetry in Medicine – Computational Issues: An Overview (Invited talk). Workshop entitled “Computational and Mathematical Challenges in Particle Therapy,” organized by Am Nucl Soc Computational Medical Physics Workgroup, held on Sunday, April 19, 2015 at Nashville, TN. Held in conjunction with the Joint International Conference on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA) and the Monte Carlo (MC) Method
3. Newhauser W, Jagetic L, Schneider C, and Zhang R, 2015, Protecting patients from radiogenic second cancers (Invited talk). 61st Annual Meeting of the Radiation Research Society, Weston, Florida, September 19-22, 2015

New Publications continued

4. Newhauser W, 2015, A Review of The Workforce for Radiation Protection in Medicine. Abstract for invited talk, to be given at the 2016 annual meeting of the National Council on Radiation Protection
5. Schurr R, Nguyen H, Pohar K, Mortazavi A, Shah Z, Zynger D, Knopp M, and Jia G, 2015, Z-spectral modeling for CEST-MRI of bladder cancer, ISMRM 19th Scientific Meeting. Toronto
6. Chafi H, Elias, Nguyen H, Friel H, KnoppM, Guo B, Heymsfield S, and Jia G, 2015, The Effect of Parallel Radiofrequency Transmission on Arterial Input Function Selection in 3T DCE-MRI of Prostate Cancer, ISMRM 19th Scientific Meeting. Toronto
7. Chen X, Chen W, Wang G, Lu J, Zhou J, Jia G, and Li J, 2015, Breath-hold CEST-MRI of Liver Cirrhosis: A Clinical Feasibility Study, ISMRM 19th Scientific Meeting. Toronto
8. Bowen S, Yuh W, Elias S, Partridge S, Jia G, Huang Z, et al., 2015, Tumor Heterogeneity: Characterization of Variability and Temporal Changes During Radiation Therapy With Multimodal Functional Imaging Biomarkers in Cervical Cancer, Radiological Society of North America (RSNA) Annual Meeting. Scientific Poster Presentation. Chicago, IL
9. W Wei, B Lathrop, G Jia, D Flanigan, A M Chaudhari, M V Knopp, et al., "Assessing the Effect of Football Play on Knee Articular Cartilage Using Delayed Gadolinium-Enhanced MRI of Cartilage (dGEMRIC)", Radiological Society of North America (RSNA) Annual Meeting. Scientific Poster Presentation. Chicago, IL
10. H Chafi, R N Schurr, J Lu, K B McKlveen, O Carmichael, G Jia, et al., "Magnetic Resonance Elastography of the Brain: Assessment of Scan-rescan Reproducibility", Radiological Society of North America (RSNA) Annual Meeting. Scientific Poster Presentation. Chicago, IL
11. H T Nguyen, A Mortazavi, K S Pohar, Z K Shah, G Jia, M V Knopp, et al., "Quantitative assessment of voxel-wise apparent diffusion coefficient using k-means clustering to predict and assess chemotherapeutic response in bladder cancer", Radiological Society of North America (RSNA) Annual Meeting. Scientific Poster Presentation. Chicago, IL

Other Presentations

1. Dr. Ningle Yu (Visiting Professor). Poster Presentation at the LSU Visiting Scholar Research Fair. Poster: Effective Approaches to Locate a Missing Radioactive Source. LSU Visiting Scholar Research Fair (sponsored by LSU International Programs in conjunction with the LSU Office of Research and Economic Development), held in Baton Rouge, Nov 17, 2015
2. Rebecca DiTusa (1st year physics undergraduate, Dr. Guang Jia's lab). Poster Presentation at the LSU 2015 Undergraduate Research Conference. Poster: Dose reconstruction of an individual's prolonged accidental exposure to an industrial radiography source, held in Baton Rouge, Nov 6, 2015

Kenneth R. Hogstrom

Superior Graduate Student Scholarship Fund

Opportunity for Alumni Support

As a highly acclaimed educator and researcher, Dr. Kenneth R. Hogstrom, Professor Emeritus, has had a remarkable impact on students and practice in the field of radiotherapy.

Dr. Hogstrom has a passion for graduate education. He served 20 years as Medical Physics Program director at The University of Texas. Graduate School of Biomedical Sciences at Houston and seven years as Medical Physics Program director in the LSU Department of Physics & Astronomy. He taught radiation physics classes, while mentoring young investigators on how to apply that knowledge such that their research could impact clinical radiation oncology. His greatest joy has been challenging and mentoring graduate students in their research. Over his 40-year career, Dr. Hogstrom supervised 20 MS and PhD students, served on the supervisory committees of another 35 students, and supervised 12 postdoctoral fellows.

Established in honor of his outstanding research, scholarship, and mentorship of graduate students, the LSU College of Science and Department of Physics and Astronomy have established the Kenneth R. Hogstrom Superior Graduate Student Scholarship in Medical Physics. This endowed scholarship will provide annual support for a MS or PhD student performing innovative research in radiation oncology physics.

We invite you to join us in honoring his deep commitment to and legacy in our field by giving to the Kenneth R. Hogstrom Superior Graduate Student Scholarship Fund. Our goal is to raise \$100,000 in collegial support, which with gifts from other individuals and Mary Bird Perkins Cancer Center will leverage matching funds from the State of Louisiana Board of Regents to create the endowed fund.

Contributions can be made using the form on the final page of this newsletter or online at www.lsufoundation.org/hogstrom.

For more information on the Kenneth R. Hogstrom Superior Graduate Student Scholarship Fund, please contact senior director of development for the LSU College of Science Emilia Gilbert at egilbe2@lsu.edu or 225-578-2321.



Exemplary researcher, scholar, and student mentor KENNETH R. HOGSTROM maintains a reputation as an outstanding professor in the field of radiation oncology physics.

Dr. Kenneth Hogstrom received his BS and MS in physics from the University of Houston and his PhD in physics (experimental nuclear) from Rice University in 1976. From 1976-79 he pursued pion radiotherapy at Los Alamos National Laboratory as a research scientist for the University of New Mexico School of Medicine. From 1979-2004 he held a faculty position at The University of Texas M. D. Anderson Cancer Center at Houston, serving as inaugural chair of the Department of Radiation Physics and holding the P.H. and Fay Etta Robinson Distinguished Professorship in Cancer Research.

In 2004, Dr. Hogstrom joined the faculty in the LSU College of Science and Department of Physics & Astronomy, holding the Dr. Charles M. Smith Endowed Chair of Medical Physics. This position included a joint appointment as chief of physics at Mary Bird Perkins Cancer Center.

Dr. Hogstrom's 40-year career has impacted both patients and providers of radiation oncology. He integrated teaching, research, and clinical practice to investigate and advance areas at the forefront of radiation oncology such as neutron, pion, image-guided, intensity-modulated, stereotactic, targeted, and electron radiotherapy.

Nationally, Dr. Hogstrom served as president of the American Association of Physicists in Medicine (AAPM), vice chair of the American Board of Medical Physics, and inaugural chair of the Residency Education Review Committee of the Commission on Accreditation of Medical Physics Education Programs (CAMPEP). He is a fellow of the AAPM, American College of Medical Physics (ACMP), and American Society for Radiation Oncology (ASTRO), and he received many prestigious honors, including the AAPM William D. Coolidge Award and the ACMP Marvin M. D. Williams Award.

Big Data in Medical Physics



“Big Data,” involving the ability to acquire, process, transport, access, and analyze large quantities of information quickly and efficiently, and “High Performance Computing” are areas highlighted in the Louisiana Office of Economic Development list of state priorities and the LSU Research and Development Office Strategic Plan. LSU’s traditional activities in this area have been focused on computationally intensive problems, such as large numerical simulations, that are characterized by requiring a large number of calculations carried out in parallel across many processors. Big Data problems differ in involving huge volumes of data, often distributed across multiple locations, large memory capacities, and high network bandwidths. They typically involve different hardware and software architectures to address the distinct technical challenges. Big Data is a rapidly developing area, both nationally and at LSU, with direct applications to LSU’s astrophysics and medical physics research efforts.

One of the many challenges in developing treatment regimens for cancer patients is that cancer is not a single disease. It’s hundreds, joined together by a common aspect – uncontrollable cell growth. “Traditionally, cancer treatment options are based off of large-scale clinical trials,” said Wayne Newhauser, Dr. Charles M. Smith Chair of Medical Physics and professor and director of LSU Medical Physics and Health Physics. “So basically, you’re basing treatment on averages. Modern medicine is moving more toward personalized medicine, which requires Big Data in order to process and analyze your DNA and genetics.” Translated, the ability to handle large, detailed images and test results and quickly analyze the resulting data set can potentially provide low-risk, high-return individual treatment plans based on a patient’s specific genetic makeup. “With the right kind of capabilities, we will be able to use imaging studies to build a genomic profile at even a basic physician’s appointment,” said Newhauser. “Some of the world’s leading institutions already have this capability. We’re only a few years away from it ourselves.” Using information to diagnose and develop treatment options is known as bioinformatics, and it’s an up-and-coming field of study that stands to revolutionize the way we look at healthcare options. “We’re not there yet in terms of applying all this information to the average cancer patient,” said Newhauser. “But we have the clues, and we know the pathways.”

News From Our Former Trainees

Dr. Wenhua Xu, Dr. Steven Heymsfield, and Dr. Guang Jia published an article titled “Quantitative Comparison of Two Dual-Energy X-ray Absorptiometry (DXA) Systems in Assessing Body Composition and Bone Mineral Measurements” in Journal of Clinical Densitometry.

Dr. Dmytro Shumilov (PhD in Physics from Texas Christian University, 2014) was part of the LSU Medical Physics group from Sept. 1, 2014 to Nov. 27, 2015, working as a postdoc under the guidance of Joyoni Dey. The group worked with Dr. Steven Heymsfield and Dr. Leanne Redman of Pennington Biomedical Research Center to mathematically analyze previously obtained data of fat and weight-gain with over-feeding of different protein content for 23 volunteers at Pennington. Analyzing these studies is important due to increasing prevalence of overweight and obesity among the population, increasing risk of a number of diseases such as hypertension, diabetes, heart disease, and cancer.

Dr. Shumilov also implemented some mathematical tumor models with Dr. Dey and assisted with mice-data acquisition at Dr. J. M. Mathis’s lab at LSU School of Veterinary Medicine to study these tumor growth models. One or two publications are expected from of this tumor modeling work. Dr. Shumilov went back to Ukraine at the end of November, with a software job (and also to get married).

Dr. Kesava Kalluri worked as a postdoc in Dr. Dey’s lab on GATE Monte-Carlo simulations on a Gamma Camera development and was instrumental in preliminary work for an NIH R01 application. Narayan Bhusal, a PhD student of Dr. Dey from the LSU Department of Physics & Astronomy is continuing Kesava’s work.

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