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

January 2017
Volume 4, No. 1

Notables

Faculty and student generated interest and excitement. In fact, 2016 was a record year for the program for media coverage.

The MS, PhD, and post-doctoral certificate programs were fully reaccredited through 2021.

The Louisiana Board of Regents approved our post doctoral certificate program.

Many new research and education grants awarded to program faculty and students, including awards from the federal government, industry, and private organizations.

Six outstanding graduate student matriculated in 2016.

Placement of graduates in accredited medical physics residencies remains at 100%.

2016 was a strong year for research papers, patents, and invited talks.

1. Director's Message

Dear Colleagues, Supporters, and Friends:

As you will see in this issue of our newsletter, 2016 was a terrific year for the Medical Physics and Health Physics program. This is evidenced by the progress and accomplishments of students and by the scholarly works of our research teams.

As most of you know from previous newsletters, the majority of our professors joined the program within the past few years. In broad strokes, this means that the program, as a whole, is still in a "building phase" and individual faculty members are at various stages of building their research laboratories. Indeed, our overall progress was even better than hoped for, with a major increase in research activities and accomplishments. Among the many success stories this year, one in particular stands out. Assistant Professor Rui Zhang, together with colleagues at LSU and MBPCC, he was awarded a large career development grant from the National Cancer Institute. This prestigious award is designed to help junior researchers transition to tenure-track positions and to foster their research careers. Dr. Zhang's team is researching advanced technology treatments for breast cancer. In fact, all of our faculty are making exciting contributions that you may read about in the newsletter.

We are excited by a relatively new trend in the program; the success of our students in obtaining grants to enhance their education and research. Grantsmanship is difficult and we have been ramping up our training efforts in this area. As you will see inside, our students are competing and winning awards in considerable numbers. In 2016, students in particular deserve special mention; PhD students Joe Steiner for his local and regional engagement and Lydia Jagetic for her international work in Europe and Central America.

An interesting part of my job is to maintain and develop our curricula. I am pleased to report that in 2016, we received reaccreditation of our MS and PhD degree programs and our post-doctoral certificate program. The latter was approved by the Board of Regents and will officially commence operation next year. The PhD curriculum, established in 2012, continues to grow and mature according to plan.

Another interesting task of mine is to create and foster various types of opportunities for our students and faculty. Doing so requires a proactive approach to building and promoting the reputation of our program, using traditional methods, such as presenting at conferences and involvement in professional societies, as well as working with the media, and preparing this newsletter. As the activities of the program continue to increase, it is becoming difficult to record and report on all of them. What a great problem to have!

Director's Message (continued)

Contents

As our reputation ascends, new opportunities have materialized. We are increasingly being sought out by leading laboratories to collaborate on medical physics research projects. For example, in the next issue, we will report on students who will be spending extended time in 2017 at leading institutions in Europe to perform research for their doctoral degrees.

Nationally, and in Louisiana, 2016 was another challenging year for higher education and healthcare. Fortunately, our program is faring well during this era of reform and budget cutting. There are many reasons for this, but chief among them are the success of our faculty in bringing in new funding for research and education, unwavering support from LSU and MBPCC, a societal need for highly-educated radiation professionals, and the commitment to excellence of our program's faculty and students. In 2017 and beyond, philanthropy will almost certainly play an increasingly vital important role in our program's success. For example, the Kenneth Hogstrom Scholarship initiative raises money to endow scholarships for outstanding young medical physics graduate students. Please see the back page of the newsletter to learn how your contribution, however large or small, can make a big difference in the education of a young medical physics student.

As we look ahead to 2017, we foresee many exciting developments and we look forward to sharing these with you. We would also like to know about your successes; please do keep in touch.

Best Wishes,

Wayne Newhauser, PhD, DABR, FAAPM
Program Director

2. Trainee Milestones

2.1 Graduations

On Wednesday, July 6th, Erin Chambers defended her master's thesis titled, “Design of a Passive Intensity Modulation Device for Bolus Electron Conformal Therapy.” Following graduation, Erin entered the medical physics residency program at the Rhode Island Hospital Warren Alpert Medical School of Brown University.

On Friday, June 17th, Desmond Fernandez defended his master’s thesis titled, “Interplay Effects in Highly Modulated Stereotactic Body Radiation Therapy Lung Cases Treated with Volumetric Modulated Arc Therapy.” Following graduation, Desmond joined the medical physics residency program at Mary Bird Perkins Cancer Center in Baton Rouge.

On Tuesday, May 24th, David Heins defended his master’s thesis titled, “Comparison of Advanced Radiotherapy Techniques for Post-Mastectomy Breast Cancer Patients.” Following graduation, David began the medical physics residency program at the Central Arkansas Radiation Therapy Institute in Little Rock, Arkansas.

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

2.2 Matriculations

The program welcomed six outstanding new medical physics students who entered the program in the Fall of 2016.

Bethany Broekhoven, master’s student, BS, Louisiana State University 2013

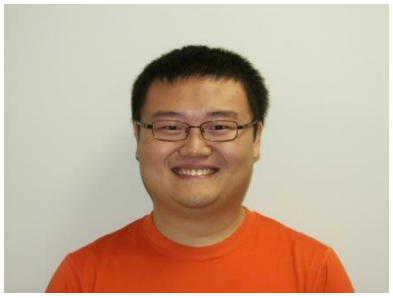
Andrew Hastings, master’s student, BS, Louisiana State University, 2016

Erika Kollitz, PhD student, BS, Worcester Polytechnic Institute, 2016

Matriculations contd.

Hanif Soysal, master's student, BS, Louisiana State University, 2015

Cameron Sprowls, master's student, BS, West Chester University, 2015



Yibo Xie, Ph.D. student, MS, Duke University, 2016

2.3 Professional Board Certifications

The following students or recent graduates passed one or more parts of the American Board of Radiology Certification Exam in Medical Physics: Part I: Joe Steiner, Desmond Fernandez, Phillip Wall, Xiaodong Zhao, and Erin Chambers, David Heins, Krystal Kirby, John Doiron. Part II: Ben Rusk, Margaret Hernandez, Adam Watts, Garrett Pitcher, Derek Freund, Bart Morris, Diane Alvarez, Ryan Posey and Melissa Lamberto.

The following recent graduate passed one or more parts of the American Board of Health Physics Certification Exam: Andy Halloran.

Congratulations to each of you! Keep making us proud.

2.4 Other

Congratulations to graduate students Michelle Lis, Suman Shrestha and Jinghzu Xu, who passed the PhD qualifying examination this year. Congratulations also to PhD students Will Donahue, Lydia Jagetic, Joseph Steiner, Paul Maggi, and Christopher Schneider, who passed their PhD general examinations.

3. Feature Stories

3.1 Partner for Life: LSU and Mary Bird Perkins Cancer Center Team Up to Beat Cancer

By Brenda Macon

LSU and Mary Bird Perkins Cancer Center (MBPCC) have an ongoing partnership that benefits not only both institutions, their students, and their staff but also the citizens of Louisiana – particularly those in the south and central parts of the state. This partnership is providing students with unique training opportunities, researchers with facilities and resources that are hard to find, and most important, patients with the latest innovations and techniques for improved outcomes in their cancer treatment. The design of the collaboration is to leverage the strengths of both institutions. The partnership gives MBPCC access to graduate students, multidisciplinary faculty, advanced computer technology, and all of the other advantages of University resources. LSU benefits by having access to clinical training for its students and clinical facilities for its faculty research. Both benefit by empowering faculty and students and providing them with opportunities to contribute to advancing patient treatment options. These advantages are fueling interest in maximizing collaboration.

The partnership has expanded and improved both programs and has allowed levels of treatment and research that otherwise would not be possible. This collaboration began years ago, first with the establishment of the medical physics program in the 1980s, and then with the hiring of two visionaries from Texas who saw the potential for building something great when they put their heads together.

http://www.lsu.edu/physics/news/2016/10/partenership.pdf

3.2 How Transdisciplinary Collaborations Are Opening New and Exciting Lines of Research

By Alison Lee Satake

trans·dis·ci·plin·ary re·search - noun \'tran(t)s, 'tranz\-'di-sə-plə-ˌner-ē\ \ri-'sərch, 'rē-ˌ\: research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem (* as defined by Harvard Transdisciplinary Research in Energetics and Cancer Center). As researchers drill down into even more specific areas of expertise, collaboration has become essential. And while most researchers, especially in the sciences, have been working with colleagues in their fields for years, more and more faculty are pushing the boundaries and coming together across disciplines to tackle some of the big challenges of today.

ADVANCING CANCER RESEARCH

The survival rate of cancer is increasing due to advances in detection and treatment. According to the National Cancer Institute, there were about 14.5 million cancer survivors in 2014, and experts project that that number will grow to about 19 million survivors by 2024.

“As a researcher, you’re trying to look over the horizon and develop the things for 10, 15, 20 years from now. What’s going to be the next big need?” asked Wayne Newhauser, director of the Medical Physics and Health Physics program at LSU. Newhauser and his students and colleagues are working on ways to continue to improve radiation treatment.

“My vision is to further improve cancer survivorship by reducing the side effects of radiation therapy. As a research community, we have in the past concentrated on curing the primary cancer, and rightly so. In the future, research will discover ways to make treatments gentler on the patient’s healthy tissues. About two out of every

3.2 How Transdisciplinary Collaborations Are Opening New and Exciting Lines of Research contd.

three cancer patients will receive radiotherapy, often together with surgery and chemotherapy. The advantages of radiation therapy are that it is non-invasive, unlike surgery, and it is highly focused on the tumor, unlike systemic chemotherapy. However, a disadvantage is that low levels of unwanted stray radiation reach the entire body. This can cause side effects. Our laboratory is working on reducing those side effects. This requires research on the physics of the radiation transport in the patient's whole body, which in turn requires novel approaches to imaging the whole body quickly and with no additional radiation exposure. Once this research is completed, we will be able to calculate the dose to all of the tissues and use that information to design treatments that have fewer side effects," he said.

For example, breast cancer is one of the most common forms of cancer. And due to the proximity to the lungs and heart, which are sensitive to radiation, researchers seek to further minimize exposure of those organs to the lowest level physically possible.

"If we can develop personalized treatments that both eradicate the tumor and spare the heart and lungs, then we can expect to improve survivorship by keeping women free from major complications down the road," he said.

To do so, Newhauser has turned to what may seem like unlikely collaborators: faculty in the LSU School of Architecture and the College of Art and Design. Utilizing 3D scanners and printers, this transdisciplinary team has been able to create models, or phantoms, of cancer patients to research personalized radiation treatment and better target cancer cells. The researchers created a phantom of a patient, who had undergone surgery that removed a tumor on his nose. After surgery, radiation is often prescribed to remove any residual disease. But because the topographical area in this case was complex, the detailed phantom was helpful to locate specific areas that needed radiation.

"I'm always on the lookout for new and interesting technologies. 3D printing is going to change how we do so many things across the human enterprise." —Wayne Newhauser, LSU Medical Physics & Health Physics program director

In addition to the physical 3D printed models, Newhauser's team is working on a mathematical model of the whole body that can simulate radiation treatment of a primary tumor and calculate the radiation dose to the whole body. "It's a very detailed yet comprehensive way to simulate radiation therapy. One needs a lot of computing power and lots of memory," he said.

He relies on the high performance computing power at the LSU Center for Computation and Technology, or CCT, for this research. Access to the supercomputers and scientific computing staff was a major draw for him to LSU from the University of Texas MD Anderson Cancer Center.

"The capacity of the high performance computing clusters like Super Mike-II are just so far beyond what's available at academic medical centers. There's no comparison," he said. Although many universities have computational centers that foster transdisciplinary work, LSU may be the only one that jointly funds research faculty through the center. CCT has joint faculty positions with the departments of physics and astronomy, chemistry, math, biology, College of the Coast and Environment, College of Human Sciences and Education, College of Engineering, College of Science, Manship School of Mass Communication, the E. J. Ourso College of Business, and the College of Music and Dramatic Arts.

"I'm not aware of any other center in the U.S. with this many faculty supported by a computational center jointly with departments drawn from such a diverse variety of disciplines. The way we're going, I think we're going to expand even more," said J. "Ram" Ramanujam, CCT director. □

The text above was excerpted from a longer article. The full piece may be found at
http://www.lsu.edu/research/downloads/research_magazine/Fall-2016_Research_Magazine.pdf

3.3 Joe Steiner talks about his research on a new prostate cancer imaging device

By Paige Jarreau

LSU College of Science: Congrats on being a finalist in the Three Minute Thesis competition! What prompted/motivated you to be in this competition? What was it like, preparing an incredibly short talk about your graduate research project?

Joe: I think it is very important to be involved as a graduate student, and so if I see opportunities like the 3MT competition, I take them. Opportunities such as this help me become more effective as a communicator, build my personal confidence level, and give me public speaking experience.

For me, preparing this type of talk works best by starting off small and adding to it. So I started off saying, "Prostate cancer imaging is lacking. My work will improve prostate cancer imaging." That is about 10 seconds. Then, I can add a sentence or two, and assess. I think this is MUCH easier than writing it all at once, because this way you don't end up with perhaps 5 or 6 minutes of material. It is difficult to cut that down because you think it is all important to the talk.

LSU College of Science: *Can you tell us about your research and why it matters in a few sentences?*

Joe: Prostate cancer imaging has reached a bottleneck in terms of image resolution. My research aims to improve resolution in prostate cancer imaging by combining recently developed, unrelated medical technologies. Improved resolution increases image quality, which reduces the uncertainty in prostate cancer management.

Joe's research involves the medical physics program at LSU, Mary Bird Perkins Cancer Center, Pennington Biomedical Research Center, XDR Radiology, the LSU Biological Sciences Department, the LSU Vet School, and the LSU Office of Innovation and Technology.

LSU College of Science: *What do you love most about your research? What's the one "fun fact" about your research that you tell everyone?*

Joe: I love building things and making things work, and this is why I spent a few years working in mechanical engineering before coming to LSU for graduate work in medical physics. My project consists of developing an entirely new method of imaging using existing, unrelated medical technologies. This is incredibly interesting to me and a very good fit for my prior skill set and what I want to do in the future. I think the most "fun fact" about my research is that everything I am using already exists and is in clinical use. I am simply putting all of these things into the mixer and hoping that a new prostate imaging technique will come out, and (quite fortunately, since I am very much looking forward to graduation) everything seems to be working so far!

LSU College of Science: *Was it challenging, condensing a talk about your research project down into three minutes? How did you decide what to include, how to hook your audience, etc.? What were your "ingredients" for this competition?*

Joe: I start off with the bare minimum and then add to it. My ingredients consist of the following:

1.Hook – Here, I try to connect with the audience. Everyone knows about cancer and what a terrible disease it is, so I try to put them in the shoes of someone who is trying to figure out if he/she has cancer, only to be told that the methodologies we currently have for doing so are not that great.

2.Significance – Here I simply answer the question of why "this" (which is prostate cancer) is a compelling problem. What are the numbers, and how can I make them relatable to the audience?

3.Problem – Why are current methods not working? What is the overarching problem I want to solve?

3.3 Joe Steiner talks about his research on a new prostate cancer imaging device contd.

4.Intro – A simple one liner where I say who I am and what I want to do.
5.Solution – In simple terms, talk about the solution I am developing in my graduate work.
6.How? – Briefly discuss how I will accomplish this work and what I have already done.
7.Closing – Restate what I want to do and the significance.

LSU College of Science: *What are you most looking forward to about the final presentation/competition?*

Joe: I am very excited to hear all of the talks. During events like this I always think "Wow! That is a great way to get that point across! How did I not think of that?" It will be a great learning opportunity in communication and public speaking.

LSU College of Science: *How has communicating your research accessible to a broader audience helped you as a researcher / graduate student?*

Joe: There are two ways in which these types of presentations have helped me as a graduate student. The first is that these types of talks help me to refocus on the "big picture." It is very easy to get lost in the minutia. These opportunities force to me take a step back and evaluate what I am doing. The other is that these types of presentations, particularly presentations that you must complete without the aid of notes or a lectern or slides, are incredible for building confidence and public speaking skills. Both confidence and public speaking are a huge part of becoming an effective researcher, professor, professional, team member and/or manager (or whatever else you might stumble into).

LSU College of Science: *What advice would you give other graduate students wanting to presenting their research to an audience of non-specialists?*

Joe: Don't be afraid to fail. I personally am still trying to overcome this, and that is why I participate in things like the 3MT. I don't want to fail, I don't want to forget half my lines, I don't want to trip over my own tongue. Doing anything like this in public is a very big fear of mine, and it is not fun – I know this from past experiences. But the fact is, everyone is afraid of this. The only difference between myself and an effective speaker is that the effective speaker overcame his or her fear. And to do that, they took opportunities to present and presented… and presented… and presented. That is my kind of formula to success. I didn't need some special skillset or a degree from an Ivy League school or to be the smartest person on stage. I simply had to work hard, be passionate about my work, and take every available opportunity to present to build my confidence and overcome my fear of failure. Now, to tie this into a "non-specialist audience," I think that the most important word in this general advice is "passionate." If you can translate some of the passion you have for your research to a non-specialist, even if you forgot half your lines or forget how to pronounce your name, even if on paper you got last place, you have succeeded and have become that much more effective as a communicator.

The full length article may be found at
http://lsuscienceblog.squarespace.com/blog/2016/11/7/the-ultimate-elevator-challenge-5-college-of-science-students-deliver-3-minute-science

3.4 LSU PhD Student Traveled Abroad to Teach Radiation in Mexico

By Allison Bruhl

University medical physics Ph.D student Lydia Jagetic joined her passion for research, teaching and travel over the summer in Ensenada, Mexico.

She almost skimmed past the opportunity in an ad called "Outreach in Mexico" in a graduate student newsletter. "It was the very last thing, so I almost completely overlooked it," Jagetic said. "It was the day the application was due, but it all worked out…I've always been really interested in outreach and traveling and other cultures and things like that, so it was a perfect combination of everything that I love," she said. "Once it caught my eye, I was sold on it."

Jagetic volunteered to teach a week-long intensive course for high school and college students in Mexico on the uses of radiation in medicine. The course was organized by Clubes de Ciencia, a non-profit organization that aims to inspire and mentor the future generation of scientists and innovators in Mexico.

3.4 LSU PhD Student Traveled Abroad to Teach Radiation in Mexico contd.

"It was an amazing experience, absolutely incredible," Jagetic said.

The majority of her students spoke English fluently, except for one. Jagetic said she was worried about him understanding the lessons.

"But he stuck it out the whole week. We had a lot of walking from place to place and he was always the one next to me trying to ask me questions, struggling through broken English," Jagetic said.

She said the boy was constantly there and engaged. The other class members were always there to help translate if there was something he really didn't understand.

He ended up earning the highest score on the final exit exam.

"It was really incredible. I couldn't believe it," she said.

"The students were so inspiring. It was a really wide range of ages, backgrounds and base knowledge levels, so I was nervous going into it, but all of them were so excited to learn and dedicated," Jagetic said.

The course consisted of four days. Half of each day was spent on lectures and the other half working on labs that correlated to what was learned in the classroom. On the last day, students had presentations with real-world scenarios.

She said her favorite moment of the trip happened after the final presentations, taking pictures and saying goodbye to the students and families.

The parents and sister of one of her students came up and gave her a hug and kiss on the cheek. The sister translated for her parents to Jagetic how her sister would come home everyday excited about what she had learned.

"It was nice to hear that it wasn't just them coming grudgingly. They went home excited for them to be learning things and their families saw that," Jagetic said.

Jagetic wants to continue teaching abroad and experiencing new cultures in third world countries as she completes her Ph.D.

Jagetic works in the lab of Wayne Newhauser in the Department of Physics and Astronomy. After receiving her Master's degree in medical physics in 2013, she spent an academic year in Croatia as a Fulbright Fellow, researching radiotherapy in developing countries.

http://www.lsunow.com/daily/lsu-phd-student-traveled-abroad-to-teach-radiation-in-mexico/article_26b98e8c-9be0-11e6-b69a-0b12666ce1fc.html

3.5 Thinking Outside the Box

By Brenda Macon

When exceptional researchers see the need for better techniques, they go beyond [their usual areas of expertise] to find answers. Sometimes those answers are found by combining unrelated and unusual bits of technology. In the case of Dr. Guang Jia, associate professor of physics, and Joseph "Joe" Steiner, a Ph.D. candidate who works with Jia, they pulled together radiation technologies, processes, and equipment from a variety of areas in medical physics to arrive at a better diagnostic tool for early detection of prostate cancer. Both Jia and Steiner recognized the deficiencies in standard prostate cancer diagnostic tools: False positives with PSA tests are in the range of eighty percent; digital rectal exams cannot provide definitive results; though CT scans yield high resolution images, they cannot differentiate soft tissue; and though MRI images can differentiate soft tissue, they have low sensitivity and low resolution and are noisy and slow. Since no one device or technique is ideal for diagnosing prostate cancer, Jia had the idea to combine several devices and techniques to create a new, more sensitive method.

Jia was aware that using MRI imaging with an endorectal coil improves resolution, and he and Steiner wondered if using an endorectal detector with the CT platform would provide even better resolution. They were also familiar with digital breast tomosynthesis, which uses low-dose x-ray projections over a limited range to produce pseudo three dimensional images. The final piece of their puzzle was to find an additional sensor small enough to

3.5 Thinking Outside the Box contd.

fit under the usually walnut-sized prostate to use with the endorectal probe; that small sensor was a dental x-ray plate, the same type used in many dentists' offices for oral x-rays. Finally, using iodine as a contrasting agent provides for better contrast.

Using these parts of existing technologies together enhances the benefits of each and ameliorates the down sides. With the device proposed by Jia and Steiner, resolution is ten times higher than using CT imaging alone. While the device is still in the prototype phase, tests using a phantom have yielded amazing results, potentially for both diagnosis and post-treatment imaging of brachytherapy seeds. The device could also be used to detect recurrent tumors that may be suspected when the patient has rising PSA results several years after the prostate has been removed. Using a kumquat to represent the prostate and a Styrofoam plug embedded with brachytherapy seeds, Jia and Steiner imaged their test phantoms using standard CT equipment and using their proposed technique.

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The contrast in resolution is stark. Structures that are only shadows or not visible at all appear clearly in the experimental images; the brachytherapy seeds, which are barely detectable in the standard images are brilliantly illuminated in the experimental ones. This new detection method has the potential to advance the diagnostic protocols for prostate cancer and prevent needless additional testing and possibly unnecessary and drastic treatment. Biopsies, which present a significant risk to patients, would be prevented. Surgeries and unnecessary radiation therapy would be avoided. And perhaps equally important, patients would be saved from the anxiety of false positives – not knowing whether they actually have cancer or not and, even if cancer is detected, not knowing where the tumor lies, how aggressively it is growing (most prostate cancer is slow-growing), or which treatment option is best for an individual patient.

Combining these four technologies – the endorectal probe system from MRI, the CT platform, digital tomosynthesis, and the dental x-ray sensor – to create a completely new process is one of the remarkable aspects of research in a university environment. Jia attributes educating his to his ability to bring these technologies together to solve problems. They bring fresh ideas and new perspectives into the classroom, and Jia accepts the challenge to keep abreast of the technology in his field so that he can provide them with the best instruction possible. "Teaching has helped me think of various modalities," he explained. "Our students are the best! Take Joe [Steiner] for example. I give him the basic idea, and he can complete it by ninety percent without anything more from me."

Steiner graduated with a degree in physics from SUNY-Buffalo and subsequently worked in a position that required knowledge of mechanical engineering. This position gave him the opportunity to solve problems creatively and to design new equipment. The job also helped him understand that he needed something more. He discovered that, while physics seemed too theoretical, engineering was a little too applied for his taste, so he looked for graduate degree programs that would give him a little of both theory and application. "Medical physics is a happy medium," he commented. "It gives me the opportunity to work with theory to develop applications, and that works for me." Steiner's experience with machining to create tools from new designs fits very well with his research with Jia.

3.5 Thinking Outside the Box contd.

Jia received his Ph.D. from Ohio State University and is an ABR certified diagnostic medical physicist. Jia has several years of experience in working with prostate cancer imaging as well as with joint cartilage imaging. His research at LSU and Mary Bird Perkins with improving diagnostic techniques for prostate cancer is yielding results with the development of a new device and technique. The research combines concepts and technology from at least four very different areas to address the issue of false positives with prostate-specific antigen (PSA) tests and digital rectal exams (DRE). His previous experience working with urologists and radiation oncologists led him to the understanding that diagnosticians needed a more sensitive device for detecting cancer in the prostate.

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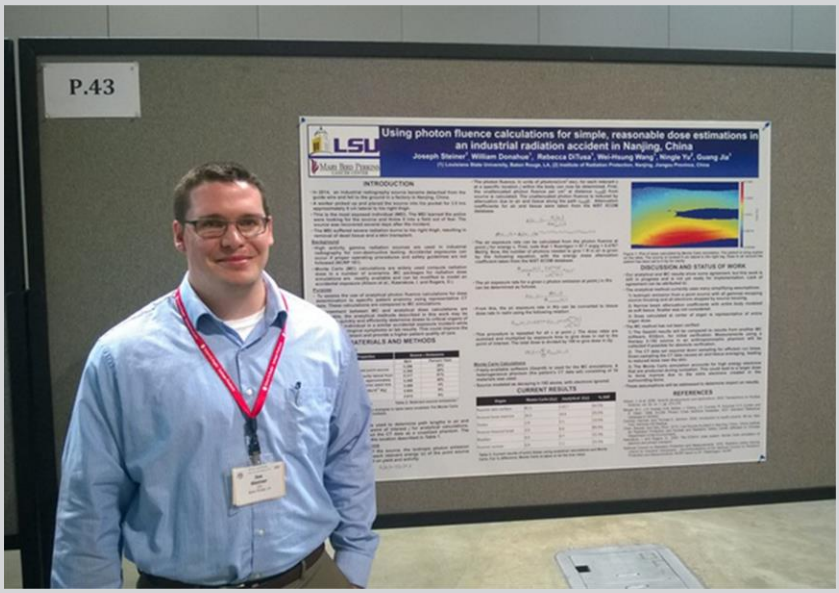
Jia also cites the cooperation among units at LSU that have aided his research and understanding of how other fields impact his own. For example, Fakhri al-Bagdadi, associate professor in the LSU School of Veterinary Medicine, has provided animal prostates to help the researchers have a better understanding of the anatomical structures they will be imaging, and Alumni Professor of Biological Sciences Dominique Homberger has given Jia insight regarding 3-D imaging of human anatomical structures. Jia and Steiner both work not only on the main LSU campus and at MBPCC but also at Pennington Biomedical Research Center, where they collaborate on additional research.

Jia is also sold on the partnership that LSU enjoys with Mary Bird Perkins Cancer Center and on the medical physics program itself. “Where I came from, the academic ranking is higher than that of LSU, but they don’t have a medical physics program,” he said. “Also, Mary Bird Perkins has a residency program that provides our own students with opportunity. Those things were very important in my decision to come to LSU.”

3.6 Joe Steiner and Will Donahue Present a Poster at the 2016 HPS Annual Meeting



By Joe Steiner

After an industrial radiography accident in China, Joe Steiner and Will Donahue became interested in comparing analytic dose calculations to Monte Carlo dose calculations.

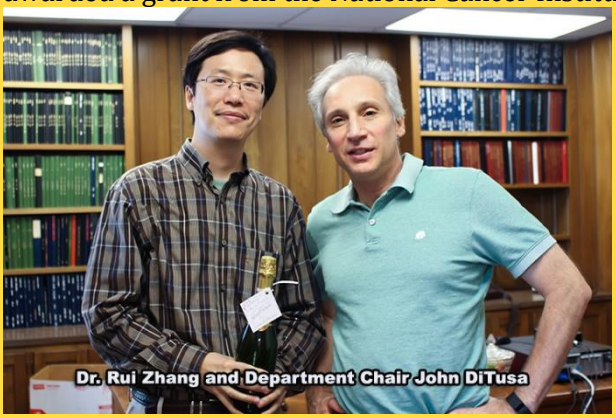
The purpose of this work is to see if a simple analytic model provides reasonable dose estimates, because such a method can be easily implemented in the event of such an accident in the future. Initial results have shown promise and the work effort continues.

https://lsu.collegiatelink.net/organization/ANSLSU/news/details/92234?fromCampus=False

3.7 LSU Medical Physicist Works to Improve Treatment Outcomes for Postmastectomy Patients

By Mimi LaValle

About one in eight U.S. women will develop invasive breast cancer over the course of her lifetime. An estimated 231,840 new cases of invasive breast cancer are expected to be diagnosed in women in the U.S. and about 40,290 women are expected to die from breast cancer this year. LSU Assistant Professor of Physics Rui Zhang was awarded a grant from the National Cancer Institute to improve treatment outcomes for breast cancer patients.


Dr. Rui Zhang and Department Chair John DiTusa

A mastectomy is highly recommended for patients with locally advanced primary breast cancer and extensive lymph node involvement. Due to the prevalence of microscopic diseases after the mastectomy, postmastectomy radiotherapy, or PMRT, is commonly performed on these patients to sterilize the residual tumor cells, and has been shown to improve the overall survival rate among patients with invasive breast cancer by reducing the risk of tumor recurrence and cancer mortality. However, long term survivors may develop life threatening acute and chronic treatment-related toxicities after radiotherapy. For example, the risk of ischemic heart disease increases with breast cancer radiotherapy dosages, according to previous studies.

PMRT options include external beam photon therapy, electron therapy and proton therapy, each with various degrees of sophistication. Most of these technologies will provide comparable target coverage, while the dose to surrounding normal tissues varies greatly. The more advanced techniques, like intensity modulated radiotherapy and proton therapy, have the potential to improve long term survival by constraining doses to radiosensitive organs, but evidence from an outcome study will not be available until years or decades later. Furthermore, the literature is largely incomplete regarding systematic comparison of potential benefits of advanced technologies for PMRT. Clinical and policy decision making is difficult because of the many possible treatment strategies, the rapid technological advancement of radiotherapy and an insufficient evidence base.

Zhang's research evaluates the efficacy of various PMRT techniques and offers rigorous theoretical evidence that will help guide clinical decision making, especially modality selection for PMRT. The National Cancer Institute awarded him a $600,000 grant to support this work.

"With this grant, we will improve understanding of the benefits, weaknesses and effectiveness of various radiotherapy modalities, especially advanced-technology modalities, in the treatment of postmastectomy breast cancer patients. It will facilitate offering evidence-based, effective patient care and can potentially benefit millions of breast cancer patients in the United States," Zhang said.

http://www.lsu.edu/physics/news/2016/09/zhang_grant.php#sthash.MJVJWJbO.dpufLSU Medical Physicist Work s to Improve Treatment Outcomes for Postmasectomy Patients

3.8 Researchers Aim to Make Intensity Modulated Therapy a Reality

Mary Bird Perkins Cancer Center staff, Professor Emeritus Ken Hogstrom and adjunct assistant professor Dr. Bobby Carver, have invented a low cost, passive technology to deliver intensity modulation for electron beam therapy. Recently, Professor Hogstrom's research group successfully translated electron conformal therapy technology using machineable wax bolus, a product line offered by .decimal LLC in Sanford, FL since 2011. Bolus electron conformal therapy (BolusECT®) conforms the 90% dose surface to the distal surface of the planning target volume (PTV), sparing distal normal tissue. The irregular entry surface of the bolus generates dose heterogeneity in the PTV; however, this PTV dose heterogeneity, as much as 30%, can be restored to 10% using intensity modulation.

3.8 Researchers Aim to Make Intensity Modulated Therapy a Reality contd.

With accelerator manufacturers hesitant to integrate an electron MLC into the treatment head, alternative methods for electron intensity modulation are required, similar to metal compensators provided for intensity modulated x-ray therapy (IMXT) prior to the x-ray MLC becoming commonplace. LSU graduate student research is playing an important role in this effort: (1) a study of parameter values for the passive electron intensity modulator was the focus of a MS thesis for recent LSU graduate Erin Chambers, MS; (2) a treatment planning study comparing BolusECT with and without intensity modulation has been the focus of an ongoing MS thesis for LSU graduate student John Doiron; and (3) a study validating intensity modulators and evaluating various patient QA methods, similar to those for individual intensity modulated x-ray fields, will be the focus of a future MS thesis for LSU graduate student Elizabeth Hilliard. With funding from a recently awarded NIH STTR grant and the joint efforts of MBPCC, .decimal LLC, and LSU graduate students, MBPCC hopes to be the first facility in the world to offer intensity modulated BolusECT.

January meeting of MBPCC, LSU, and .decimal team to discuss technical solutions for translating intensity modulation into .decimal LLC's BolusECT® (L–R : LSU MS student John Doiron, .decimal chief technology officer Kevin Erhart, PhD, professor Ken Hogstrom, .decimal computer programmer Daniel Patenaude, and assistant professor Bobby Carver.)

3.9 Abbie Wood Joins MBPCC Team

Dr. Abbie Wood was appointed by the MBPCC team as a medical physicist in December 2016. She hails from Loyola University Chicago where she was an assistant professor of Radiation Oncology, and Loyola University Medical Center where she was a clinical medical physicist. Dr. Wood earned her Ph.D. from the University of Chicago in 2011.

Dr. Wood's research interests lie in utilizing magnetic resonance (MR) imaging for applications in radiation therapy. She is particularly interested in MR-guided radiation therapy planning and delivery.

Accurate radiation dose calculations rely on the electron density information gleaned from CT imaging, however there is a great deal of research interest in utilizing only MR images for radiotherapy planning. MR images have superior soft tissue contrast compared to CT images, and the need for image registration is circumvented in single-modality RT planning. Thus a reliable substitute for CT images is needed to accurately model the transport of radiation in tissue for MR-only planning. One of her main research interests are in generating substitute or synthetic CT data from MR data. In particular, she designed a study to determine whether spectroscopic imaging could be used for this purpose. Another main research interest is studying the effects and potential benefits of hyperoxia for radiation treatment of hypoxic tumors.

3.10 LSU ANS Student Section Participates at Boy Scout Atomic Energy Merit Badge Workshop at River Bend Nuclear Power Plant

By Joe Steiner

Phillip Wall, Paul Maggi, and Joe Steiner of the LSU American Nuclear Society (ANS) Student Section managed a workshop teaching Boy Scouts about electroscopes and industrial radiography at the River Bend Nuclear Power Plant on Oct. 29, 2016. These student members helped 68 scouts earn their atomic energy merit badge.

Phillip and Paul instructed the scouts on the basics of electroscopes and then began to use the electroscopes to see the principle in action. In one of the electroscopes was placed a thorium lantern mantle, a smoke detector americium source, and some uranium rocks. This caused the leaves to lose charge faster, and led to a discussion of why this works (ionization of air) and how our Geiger-Mueller detectors worked.

Joe instructed the scouts on the basic principles of industrial radiography, going from very basic principles, such as a thicker material "absorbs" more radiation, to drawing examples of weak spots in pipes and welds to performing simple experiments with a GM detector. The simple experiments consisted of finding a "weak spot" in a "metal plate" covering a fiesta ware dish (this metal plate was lead wrapped in tin foil with a patch in the middle with no lead) and locating a radioactive material, such as uranium rock, under an opaque material. All of the scouts were able to use a GM detector and/or charge/handle the electroscopes if they desired. It turned out to be a very positive experience for all.

4. Selected Grants, Honors, and Awards

4.1 Grants

4.1.1 Faculty

Dr. Wayne Newhauser and Dr. Wei-Hsung Wang were awarded a Faculty Development Grant from the Nuclear Regulatory Commission. The grant provides $450,000 to hire two tenure-track faculty members to teach in the Program's curriculum. LSU's Office of Research and Economic Development (ORED) and Office of the Provosts provided commitments of matching funds. The project is an interdisciplinary, intercollege partnership involving the Medical Physics and Health Physics Program, the Department of Environmental Sciences, the College of Science, and the College of Coast and the Environment. A search is currently underway for two new faculty– stay tuned for an update in the next newsletter.

Dr. Ken Hogstrom received an award from the NIH to develop intensity-modulate electron beam therapy. Mary Bird Perkins Cancer Center (PI-Prof. Ken Hogstrom) joined forces with .decimal LLC (PI-Dr. Kevin Erhart) to be awarded a Phase I Small Business Technology Transfer (STTR) grant entitled "Product Development of Intensity Modulation for Bolus Electron Conformal Therapy." The $261,141 for the one-year grant from the National Cancer Institute of the National Institutes of Health will support efforts at .decimal LLC in Sanford, FL and at Mary Bird Perkins Cancer Center. The objective of the grant is to demonstrate the feasibility of planning and delivering intensity modulated electron beams for bolus electron conformal therapy (BolusECT®), a product which has been available through .decimal LLC since 2011. Further description of this program is mentioned earlier in the newsletter.

Dr. Rui Zhang received a career development award from the NIH. Dr. Zhang's research evaluates the efficacy of various PMRT techniques and offers rigorous theoretical evidence that will help guide clinical decision making, especially modality selection for PMRT. The National Cancer Institute awarded him a $580,000 grant to support this work. This project is a collaborative research involving the Louisiana State University, Medical physics program and Mary Bird Perkins Cancer Center. With this grant, we will improve understanding of the benefits, weaknesses and effectiveness of various radiotherapy modalities, especially advanced-technology modalities, in the treatment of post-mastectomy breast cancer patients. It will facilitate offering evidence-based, effective patient care in the United States.

Dr. Joyoni Dey received internal research funding grant of $36,000 from Office of Research, College of Science, and Department of Physics and Astronomy to develop a curved CsI detector with a leading detector development company, RMD (Watertown, MA). The new detector promises breakthrough improvements in SPECT imaging.

Dr. Joyoni Dey also received an SEC travel grant to visit Dr. Jason Valentine of the Department of Mechanical Engineering, School of Engineering, Vanderbilt University to collaborate on developing a low-cost grating system for Phase Contrast X ray.

Dr. Guang Jia, PhD student Joseph Steiner, and Dr. Kenneth Matthews II, received an LSU LIFT2 award for $39,345, to complete work on an endorectal digital prostate tomosynthesis device for high resolution 3D prostate cancer screening and diagnosis. The award was announced December 14, 2016.

4.1.2 Students

MS student Bethany Broekhoven was selected to receive a prestigious graduate fellowship in health physics. The award comprises a stipend of $17,500 per year. The award was made possible by a grant from the Nuclear Regulatory Commission. Bethany's interest includes the inter-related fields of medical physics and medical health physics.

MS student Andrew Hastings, a veteran of the US armed forces, matriculated and was also a finalist in the competition for a fellowship in health physics (described above). Andrew, thank you for your service.

PhD student Christopher Schneider was awarded a Chateaubriand Fellowship in order to support six months of research at the Curie Institute in Paris, France. Chris left for Paris in December 2016. His work in Paris comprises collaborative research to develop new tools for clinicians to use for advanced-technology radiotherapy. In particular, his work concerns stray radiation exposures to patients from x-ray and proton therapies. This research is part of Chris's doctoral research project. According to Wayne Newhauser, his major professor, ''It may be of interest to the LSU community that leading institutions around the globe are reaching out to collaborate with our faculty and students. This reflects well on Chris and many others in the program whose dedication and excellence are being internationally recognized.

PhD student William Donahue was awarded a Graduate School Dean's Travel Awards to fund travel in order to present his research. Will traveled to the annual meeting of the American Nuclear Society where he presented on a recent publication.

Will also received a travel grant from the American Nuclear Society. He participated in the student program at the ANS annual meeting.

PhD student Lydia Jagetic was awarded Graduate School Dean's Travel Awards to fund travel in order to present research at national and international conferences. Lydia traveled the Alpe-Adria Medical Physics meeting, held in Zagreb, Croatia where she gave two oral presentations on her work in developing and validating whole-body dose calculation algorithms.

PhD student Joseph Steiner received a Health Physics Society Medical Health Physics Section Student Travel Award to present at the national conference. Interestingly, like several other current students and recent graduates, Joe's interests are multidisciplinary, including elements of medical physics and health physics.

PhD student Joseph Steiner was offered the American Nuclear Society Utility Working Group Conference Internship, where he will attend a 3 day conference on the nuclear power industry. Joe exemplifies the level of effort, commitment, and engagement of our graduate students.

(Student Grants, continued)

PhD student Joe Steiner and MS student Elizabeth Hilliard were awarded a $500 grant from the American Nuclear Society (ANS). The award supported an outreach event hosted by the local ANS Student Section. The workshop was held on Nov. 12 at MBPCC for the benefit of a local Girl Scout troop earned their "Get to Know Nuclear" patch.

PhD student Paul Maggi was awarded a student grant for the 2016 North American Particle Accelerator Conference. The conference was held in Chicago, IL, on October 9-14, 2016. Paul presented a poster on his dissertation research, a spectrometer for evaluating electron beams produced by clinical radiotherapy accelerators. Paul's career interests lie in the area of accelerator physics and its application to medical physics

4.2 Awards and Honors

PhD student Joe Steiner was among the top 10 finalists competing in the LSU Three Minute Thesis Finals Competition on Wednesday, Nov. 9, 2016. The event, held in the Digital Media Arts and Engineering Auditorium provided an opportunity to hear the outstanding research being conducted by LSU graduate students, explained in an accessible and engaging way.

PhD student Will Donahue was selected to receive a travel award to attend an Integrated course in Biology and Physics of Radiation Oncology (IBPRO). Will was the only graduate student selected to attend this prestigious training workshop. IBPRO is a joint effort of Wayne State University's College of Education and School of Medicine funded by the NCI Center for Cancer Training. The course presents knowledge, experience, insight and ideas for future research and treatment approaches in new and innovative ways.

PhD student Lydia Jagetic was awarded the Alpe-Adria Award for best presentation at the 2016 Alpe-Adria Medical Physics Meeting held in Zagreb, Croatia.

PhD student William Donahue was awarded a 4th place prize in the poster competition at the 2016 Southwest Chapter of the American Association of Physicists in Medicine (SWAAPM) Annual Meeting.

Left to right: Barry Smith of NELCO (award sponsor), Will Donahue (LSU), and Kip Matthews (2016 SWAAPM President).

PhD student Paul Maggi won 4th place for his oral presentation at the 2016 Meeting of the SWAAPM.

Left to right: Kip Matthews (2016 SWAAPM President) and Paul Maggi (LSU).

5. Faculty Appointments and Elected Positions

Dr. Wayne Newhauser was reappointed to serve another term on the International Advisory Board of the journal Physics in Medicine and Biology. PMB is widely considered the top journal of medical physics, together with the journal Medical Physics.

Dr. Kip Matthews served as the elected 2016 President of the South West Chapter of the American Association of Physicists in Medicine (SWAAPM).

The American Association of Physicists in Medicine (AAPM) elected Dr. Wayne Newhauser a Fellow of the Association. The category of Fellow honors members who have distinguished themselves by their contributions in research, education, or leadership in the medical physics community. The award was presented at the Annual Meeting of the AAPM in Washington, DC on August 1, 2016.

Dr. Wayne Newhauser was recently appointed co-Chair Committee Council No. 2 (CC2) of the National Council on Radiation Protection and Measurements (NCRP). The NCRP was chartered by the United States Congress and advises on matters pertaining to radiation. The CC2 focusses on the adequacy of the workforce of radiation professionals to meet our nation's current and future needs, including in the areas of medical and health physics.

Dr. Abbie Wood was appointed by the MBPCC team as a medical physicist in December of this year. Please see the feature story on Dr. Wood elsewhere on this newsletter.

Dr. Wayne Newhauser won an election of the Society of Directors of Academic Medical Physics Programs (SDAMPP) for the office of board member from a graduate program. His term of office commences Jan 1, 2017 and will run for two years. According to Newhauser, "All of the candidates for the board of directors positions are highly qualified. I believe the reason I was elected is because of our program, a partnership of LSU and MBPCC, has a reputation for excellence."

6. Medical Physics Program in the News

3-D printers new weapon in cancer fight at Mary Bird Perkins
https://www.businessreport.com/article/3-d-printers-new-weapon-cancer-fight-mary-bird-perkins

Another dimension: Mary Bird Perkins and LSU have become national leaders in the use of 3-D printers to fight cancer.
http://www.hhnmag.com/articles/7031-Three-d-printed-models-gaining-favor-with-surgeons?utm_campaign=041316&utm_medium=email&utm_source=hhndaily&utm_source=hhndaily&utm_medium=email&utm_campaign=041416&eid=331512651&bid=1371695

LSU's Mike VI taken to Mary Bird Perkins – Our Lady of the Lake Cancer Center for stereotactic radiotherapy
http://www.lsu.edu/miketiger/2016-06-01-radiotheraphy.php
http://www.lsu.edu/miketiger/

Professor, doctoral candidate develop device to improve prostate cancer screening
http://www.lsunow.com/daily/professor-doctoral-candidate-develop-device-to-improve-prostate-cancer-screening/article_3e9840aa-ca05-11e5-87ab-9fefed6b8ed9.html

The Ultimate Elevator Challenge: 5 College of Science Students Deliver 3-Minute Science http://lsuscience-blog.squarespace.com/blog/2016/11/7/the-ultimate-elevator-challenge-5-college-of-science-students-deliver-3-minute-science

LSU-MBPCC 3-D printing efforts were featured in LSU's #ResearchWorks campaign video
https://www.youtube.com/watch?v=5gcoUt2Ywpo&feature=share

6. Medical Physics Program in the News contd.

Professors work to incorporate 3-D printers into cancer treatment
http://www.lsunow.com/daily/professors-work-to-incorporate--d-printers-into-cancer-treatment/article_e7f73348-f608-11e5-9073-0733b7d803e4.html

LSU Foundation features 3-D printing research for cancer therapy
http://www.lsufoundation.org/s/1585/social.aspx?sid=1585&gid=1&pgid=1660

Local newspaper reports "3-D printing helps Baton Rouge doctors, scientists create safer cancer radiation treatments"
http://www.theadvocate.com/baton_rouge/entertainment_life/health_fitness/article_a8b2105b-af39-58b0-aad8-a9bb6b00e3c0.html

Local television station features 3-D printing research for cancer therapy
http://www.wafb.com/clip/12157551/healhline-january-21

PhD Student Lydia Jagetic Teaches Students in Mexico about Radiation in Medicine
http://lsuscienceblog.squarespace.com/blog/2016/9/29/its-a-rad-world-lsu-phd-student-lydia-jagetic-teaches-students-in-mexico-about-radiation-in-medicine
and
http://www.lsunow.com/daily/lsu-phd-student-traveled-abroad-to-teach-radiation-in-mexico/article_26b98e8c-9be0-11e6-b69a-0b12666ce1fc.html

Dr. Rui Zhang Awarded a $600,000 Grant from the National Cancer Institute to Improve Treatment Outcomes for Postmasectomy Patients
http://www.lsu.edu/physics/news/2016/09/zhang_grant.php

Medical Physics Research featured in LSU Research Magazine: "Big Ideas: Transdisciplinary Research -- Team Science» in the section ADVANCING CANCER TREATMENT on pages 20-21
http://www.lsu.edu/research/downloads/research_magazine/Fall-2016_Research_Magazine.pdf

Dr. Newhauser elected fellow of the American Association of Physicists in Medicine (AAPM).
http://theadvocate.com/news/business/15280911-123/business-honors-for-april-10-2016

MS student Elizabeth Hilliard and PhD student Joe Steiner received PIA Nuclear Science Week grant award
http://www.ans.org/pi/news/article-582/

3-D Printed Models Gain Favor with Surgeons, Hospitals and Healthcare Networks Magazines, April edition
http://www.hhnmag.com/articles/7031-Three-d-printed-models-gaining-favor-with-surgeons

Post Doctoral Fellow Certificate Program Approved by Board of Regents
http://aadb.regents.state.la.us/

Dr. Kip Matthews imaging research featured on LSU High Performance Computing website
http://www.hpc.lsu.edu/resources/visualization/index.php

LSU ANS Student Section helps out at Boy Scout Atomic Energy Merit Badge workshop at the River Bend Nuclear Power Plant
https://lsu.collegiatelink.net/organization/ANSLSU/news/details/101082

GIRL SCOUTS LEARN THE SCIENCE OF CANCER CARE
http://healthcarejournalbr.com/news/girl-scouts-learn-the-science-of-cancer-care

7. Selected Publications

7.1 Journal Articles

1. Newhauser WD, 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. Vol 6, article 13 (2016).
2. Hernandez M, Zhang R, Sanders M, Newhauser W. A treatment planning comparison of volumetric modulated arc therapy and proton therapy for a sample of breast cancer patients treated with post-mastectomy radiotherapy. J Proton Therapy, 1:1 1-7 (2016)
3. D. Shumilov, S. B. Heymsfield, Leanne M. Redman, K. Kalluri, J. Dey, "New Compartment Model Analysis of Lean-Mass and Fat-Mass Growth with Overfeeding", to appear Nutrition, vol. 32, no. 5, pp. 590-600, May 2016
4. C. Chan, J. Dey, Y. Grobshtein, J. Wu, Y-H Liu, R. Lampert, A. J. Sinusas, C. Liu, "The Impact of the Dimension of System Matrix and Object Support in Reconstruction for a Stationary Dedicated Cardiac SPECT with Truncated Projections", Medical Physics, vol. 40, no. 1, pp. 213-224, Jan 2016
5. M. A King, J. M. Mukherjee, A. Konik, I.Zubal, J. Dey, R. Licho, "Design of a Multi-Pinhole Collimator for I-123 DaTscan Imaging on Dual-Headed SPECT Systems in Combination with a Fan-Beam Collimator", IEEE Trans. Nuclear Science, vol. 63, no. 1, pp. 90-97, Feb 2016
6. M. Smyczynski, H. Gifford, J. Dey, A. Lehovich, J. McNamara, P. Segars, M. A. King, "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, vol. 63, no. 1, pp. 130-139, Feb 2016
7. W. Donahue, W. Newhauser, J. Ziegler, "Analytical model for ion stopping power and range in the therapeutic energy interval for beams of hydrogen and heavier ions", Institute of Physics and Engineering in Medicine Physics in Medicine and Biology, Volume 61, Number 17
8. Eley, J. G., Friedrich, T., Homann, K. L., Howell, R. M., Scholz, M., Durante, M., & Newhauser, W. D. (2016). Comparative Risk Predictions of Second Cancers After Carbon-Ion Therapy Versus Proton Therapy. *International Journal of Radiation Oncology* Biology *Physics*, 95(1), 179-286. Doi: http://dx.doi.org/10.1016/j.ijrobp.2016.02.032
9. Carver R.L., Sprunger C.P., Hogstrom K.R., Popple R.A., and Antolak J.A., Evaluation of the Eclipse eMC algorithm for bolus electron conformal therapy using a standard verification data set. Journal of Applied Clinical Medical Physics, 17(3):52-60, 2016.
10. Pitcher G.M., Hogstrom K.R., and Carver R.L., Radiation leakage dose from Elekta electron collimation system. Journal of Applied Clinical Medical Physics 17(5):157-176, 2016.
11. Rusk B.D., Carver R.L., Gibbons J.P., and Hogstrom K.R., A dosimetric comparison of copper and Cerrobend electron inserts. Journal of Applied Clinical Medical Physics 17(5):245-261, 2016.
12. Newhauser W., The Medical Physics Workforce. Health Physics Journal, Accepted.
13. Chapman J, Knutson N, Fontenot J, Newhauser W, Hogstrom K. Evaluating the accuracy of a three-term pencil beam algorithm in heterogeneous media, Phys Med Biol. Accepted
14. Steiner J, Leniwander P. Using the Health Physics Student Volunteer Program for a research project sponsored by the medical section of the Health Physics Society. Health Physics Journal 112(3) 2017 (accepted 12/13/2016)

7.2 Patents

Pablo Yepes, John Eley, and Wayne Newhauser were awarded US Patent titled "GPU-Based Fast Dose Calculator for Cancer Therapy" on November 15, 2016.
https://www.google.com/patents/US20140032185

Jia G, Steiner J, Matthews II, K. High-resolution tomosynthesis-based x-ray imaging device, system and method for internal tissues. Provisional patent application; filed May 1, 2016.

7.3 Abstracts

ANS Annual Meeting 2016

Schneider, C. W., & Newhauser, W. D. (2016). Broadly Applicable Dose Model for Radiotherapy Beams from 6–25 MV. Paper presented at the 2016 American Nuclear Society Annual Meeting, New Orleans, LA.

Jagetic, L. J., Newhauser, W. D., Carver, R., & Zhang, R. (2016). Validation of an analytical model for therapeutic and stray dose calculations of 6 MV photon beams. Paper presented at the 2016 American Nuclear Society Annual Meeting, New Orleans, LA.

Donahue, W., Newhauser, W. D., & Ziegler, J. F. (2016). Analytical Stopping Power and Range Parameterization for Therapeutic Energy Intervals. Paper presented at the 2016 American Nuclear Society Annual Meeting, New Orleans, LA.

ICRS-RPSD Meeting 2016

Schneider, C. W., & Newhauser, W. D. (2016). Broadly Applicable Dose Model for Radiotherapy Beams from 6–25 MV. Paper presented at the 13th International Conference on Radiation Shielding (ICRS-13) and 19th Topical Meeting of the Radiation Protection & Shielding Division (RPSD-2016), Paris, France.

Jagetic, L. J., Newhauser, W. D., Carver, R., & Zhang, R. (2016). Validation of an analytical model for therapeutic and stray dose calculations of 6 MV photon beams. Paper presented at the 13th International Conference on Radiation Shielding (ICRS-13) and 19th Topical Meeting of the Radiation Protection & Shielding Division (RPSD-2016), Paris, France.

AAPM Annual Meeting 2016

SU-G-TeP1-02: Analytical Stopping Power and Range Parameterization for Therapeutic Energy Intervals. Donahue, W and Newhauser, W and Ziegler, J F, Medical Physics, 43, 3652-3652 (2016)

Steiner J, Matthews K, Jia G. Improved imaging of permanent prostate brachytherapy seed implants by combining an endorectal x-ray sensor with a CT scanner. AAPM Annual Meeting, Washington, DC, August 2016.

SWAAPM Annual Meeting 2016

Chafi, H., Schurr, R., Lu, J., McKlveen, K., Carmichael, O., Jia, G., and Knopp, M. (2016). Magnetic resonance elastography of the brain: Assessment of scan-rescan reproducibility. Paper presented at the 2016 Southwest American Association of Physicists in Medicine Annual Chapter Meeting, New Orleans, LA.

Maggi, P., Clemons, K., Walter, A., Subramanian, R., Monroe, W., and Matthews II, K. (2016). Electrically Induced Targeted Osmotic Lysis in Cancer Cells. Paper presented at the 2016 Southwest American Association of Physicists in Medicine Annual Chapter Meeting, New Orleans, LA.

Schneider, C. W., & Newhauser, W. D. (2016). A simple, broadly applicable model of therapeutic and stray absorbed dose from 6 MV to 25 MV photon beams. Paper presented at the 2016 Southwest American Association of Physicists in Medicine Annual Chapter Meeting, New Orleans, LA.

Jagetic, L. J., Newhauser, W. D., Carver, R., & Zhang, R. (2016). Validation of an analytical model for therapeutic and stray dose calculations of 6 MV photon beams. Paper presented at the 2016 Southwest American Association of Physicists in Medicine Annual Chapter Meeting, New Orleans, LA.

Steiner J, Matthews K, Jia G. Improved imaging of permanent prostate brachytherapy seed implants by combining an endorectal x-ray sensor with a CT scanner. Paper presented at the 2016 Southwest American Association of Physicists in Medicine Annual Chapter Meeting, New Orleans, LA.

Donahue, W., Newhauser, W. D., & Ziegler, J. F. (2016). Analytical Stopping Power and Range Parameterization for Therapeutic Energy Intervals. Paper presented at the 2016 Southwest American Association of Physicists in Medicine Annual Chapter Meeting, New Orleans, LA.

7th Annual AAMP Meeting (Alpe-Adria Medical Physics Meeting)
Jagetic LW& Newhauser, WD (2016). A simple and fast physics-based analytical method to calculate therapeutic and stray doses from external-beam, 6-MV conventional x-ray therapy. In H. Hrsak & M. Budanec (Eds.), *7th AAMP Meeting*. Abstract presented at The Alpe-Adria Medical Physics Meeting, Zagreb, Croatia, 19-21 May (pp. 98-103).http://aampm2016.eu/wp-content/uploads/2016/03/7th-AAMPM-2016-Proceedings.pdf

Jagetic LW, Newhauser, WD, & Carver, R (2016). A novel method to characterize uncertainties in radiation exposures to organs and tissues of the entire human body. In H. Hrsak & M. Budanec (Eds.), *7th AAMP Meeting*. Abstract presented at The Alpe-Adria Medical Physics Meeting, Zagreb, Croatia, 19-21 May (pp. 104-108).http://aampm2016.eu/wp-content/uploads/2016/03/7th-AAMPM-2016-Proceedings.pdf

Health Physics Society Annual Meeting
Steiner J, Donahue W, DiTusa R, Wang WH, Yu N, Jia, G. Assessing the use of photon fluence calculations for simple and reasonable dose estimations in an industrial radiation accident in Nanjing, China. Health Physics Society Annual Meeting, Spokane, WA. July 2016. Poster.

Steiner J. Current Radiation Safety Guidance for Death of Patients Treated with Sealed or Unsealed Radioactive Therapy Sources – Part 1. Health Physics Society Annual Meeting, Spokane, WA. July 2016. Oral presentation.

7.4 Selected Other Presentations – Inside and Outside LSU

Wilso, LJ. On behalf of the Medical Physics Program, Lydia participated in Engineering Day at the Louisiana Art and Science museum on April 2, 2016, with a collection of demonstrations including natural sources of radiation and the applications of 3-D printing to the cancer treatments.

Maggi P. Invited lectures “X-ray Imaging Concepts” and “Computed Tomography (CT)” for LSU Honors College class HNRS 3035 “3D Imaging and Animations”, Spring 2016.

Newhauser WD. The intersection of biology and physics in human oncology. Invited talk.
Computational Biology Seminar Series for Undergraduates. Sponsored by the LSU College of Science, the Department of Biological Sciences, the Center for Computation & Technology and the Louisiana Biomedical Research Network
http://lbrn.lsu.edu/events/comp-bio/newhauser.html

Newhauser WD. Applications of 3d printing in medicine. Invited talk to undergraduate biology students. October 10, 2016, Beta Beta Beta National Biological Honor Society (LSU Chapter)

Newhauser, WD. Medical Physics Program: The LSU Perspective. LSU College of Science Executive Committee Meeting, held October 21, 2016, at Baton Rouge.

Fontenot, JD. Medical Physics Program: The MBP Perspective. LSU College of Science Executive Committee Meeting, held October 21, 2016, at Baton Rouge.

Stevens, TD. Medical Physics Program. LSU College of Science Executive Committee Meeting, held October 21, 2016, at Baton Rouge.

7.5 Invited Talks Outside LSU

Newhauser WD. Medical Radiation Exposures and Risks. Workshop on "Metrology for Biological Radiation Effects" held on 6-7 June, 2016, at Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany.

Newhauser WD. Dosimetry for Epidemiology Cohorts Who Receive Radiation Therapy. Eurados Winter School, Politecnico di Milano, Milan, Italy, Feb 9 2016.

Newhauser WD. Radiotherapy and Late Effects: Recent Advances and Future Directions, Ludwig Maximilians University (LMU) Munich, Department of Physics (Garching), Feb 12, 2016

Newhauser WD, A review of the workforce for radiation protection. Louisiana Nuclear Society (Deep South Chapter) and Health Physics Society (Louisiana Chapter), March 16, 2016, at Baton Rouge, LA.

A Review of the Workforce For Radiation Protection In Medicine, Annual Meeting of the NCRP, April 11-12, 2016 Bethesda, MD.

Newhauser WD. The Physics of Proton Therapy, CIRMS annual meeting, April 18, 2016, Gaithersburg, MD.

Newhauser WD, Secondary doses from particle therapy. Workshop on Risk of Secondary Cancer Following Radiotherapy, September 8-9, 2016, The Royal Swedish Academy of Sciences, Stockholm, Sweden. http://www.crpr-su.se/smn/program.html

Medical Physics graduate students Phillip Wall and John Doiron served as program representatives at the Graduate Studies Fair, held November 17, 2016, at LSU (Baton Rouge) in the Student Union. The event targeted students focusing on graduate student experiences and financing a graduate education.

7.6 Seminars, Events, and Visitors to Our Program

On Friday, February 5th, 2016, the Medical Physics Group hosted guest speaker Dr. Tianliang Gu with a seminar titled, “Clinical MRI Physicist Roles.”

The Medical Physics Group welcomed guest speaker Dr. Terry Wu with a seminar titled, “Proton Therapy Research at Willis-Knighton Cancer Center” on Friday, April 8th, 2016

The Medical Physics Group hosted a seminar titled “A Day in the Life of a PET Physicist” by Dr. Steve Lokitz on Friday, April 29th, 2016.

MS student Elizabeth Hilliard and PhD student Joe Steiner put on an outreach event through our local ANS Student Section. The workshop was held at MBPCC on Nov. 12, 2016 with the local Girl Scout troop to help them get their "Get to Know Nuclear" patch.

Photo: Pictured, l-r, Joe Steiner, an LSU medical physics graduate student and president of the American Nuclear Society – LSU Chapter, helps Girl Scouts Savannah Tyer and Claire Carroll test everyday items for radioactivity, demonstrating that radiation and radioactivity are a natural part of our world. Photo from http://healthcarejournalbr.com/news/girl-scouts-learn-the-science-of-cancer-care.

8. Extra-curricular

Spring Crawfish Boil

This spring, the program once again held the annual Health Physics Crawfish Boil. The students prepared mountains of fresh boiled crawfish, corn, and potatoes. We are grateful to Mirion Technologies, our corporate sponsor, for their generous support of this event.

About our sponsor: Mirion is comprised of over 1000 talented professionals, passionate about delivering world class products, services, and solutions in the world of radiation detection and protection. From 13 operating facilities across North America, Europe, and Asia, Mirion Technologies offers products and services in 5 key areas: Health Physics - Radiation Detection and Protection Instruments; Radiation Monitoring Systems - In-Plant and Safety Monitoring Systems; Imaging Systems - Cameras for Extreme Environments; Dosimetry Services - Radiation Monitoring Services; and Sensing Systems - Nuclear Reactor Sensing Systems. Please visit https://www.mirion.com/.

MIRION TECHNOLOGIES

Annual Winter Holiday Celebration

Just a few weeks ago we celebrated at the program's annual winter holiday. This event features southern specialties such as smoked beef brisket, pulled pork, sweet potatoes, and pecan pie. Thanks to all those who brought all the delicious side dishes, deserts, and spirits. A ping pong tournament was popular with the kids and grownups alike. The streak of good luck continued regarding the weather and kids had a nice time playing horse shoes and buckets. Even with more than 80 guests, we couldn't finish off the feast; thanks to all those who packed up take-home boxes. A special thanks to Susan Hammond, Kip Matthews, and all of those who helped make this celebration a success.

9. Philanthropy

Dear Alumni,

If you have not yet done so, please join me in this unique opportunity to endow a graduate student scholarship, supporting research benefitting radiation oncology patients, and honoring Dr. Kenneth Hogstrom. The LSU Medical and Health Physics Program has established the Kenneth R. Hogstrom Superior Graduate Student Scholarship in Medical Physics as a means of honoring retired Program Director Dr. Hogstrom's contributions to the joint LSU-MBPCC Program.

Mary Bird Perkins Cancer Center showed its support through a $100,000 pledge, and Dr. Hogstrom made an equally significant gift that reflects his ongoing commitment that all program students have stipend support throughout their graduate career. Additional scholarship funds are being sought from former students, friends, and colleagues of Dr. Hogstrom, and to date 60 individuals including five alumni have contributed over $40,000 towards our goal of $100,000 with major alumni participation. The program recently submitted a proposal to the LSU Board of Regents to receive matching funds ($40,000 from LSU Board of Regents) for every $60,000 raised.

Each year, the Kenneth R. Hogstrom Superior Graduate Student Scholarship will be awarded to support a MS or PhD student performing research in radiation oncology physics. We hope to be able to support our first awardee during the upcoming 2017-8 academic year.

As an alumnus, please help your LSU Medical and Health Physics program, improve care of future radiation therapy patients, and honor Dr. Hogstrom by contributing to the fund if you have not already done so. This is an opportunity to help future students. Contributions can be made online at www.lsufoundation.org/hogstrom or by contacting senior director of development for the LSU College of Science Emilia Gilbert at egilbe2@lsu.edu or 225-578-2321.

Your support is more important today than ever before. Thank you in advance for your contribution. And please know that however large or small, YOUR contribution will make all the difference to an outstanding young student.

Sincerely,

Wayne Newhauser,
PhD, Program Director

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.

DONATE TODAY!

LSU

Please make your check payable to: **"LSU Foundation"** note **"Hogstrom Scholarship"** on the memo line.

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