



Department of
Physics & Astronomy



MARY BIRD PERKINS
CANCER CENTER

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Medical Physics and Health Physics Program Newsletter

1. Director's Message

Dear Alumni, Students, Staff, Colleagues, and Friends:

2019 was another great year for the Medical Physics and Health Physics Program and for LSU. Our students continued to make remarkable contributions through their research projects. As in past years, each of our graduates was hired into a prestigious program. Many of our faculty were recognized for their excellence in research and teaching.

Teamwork is the key to our program's success. Our faculty, students, staff, administration, sponsors, and benefactors worked in close collaboration to accomplish many tasks, large and small. Working with the LSU administration and the US Nuclear Regulatory Commission, we hired tenure-track full-time faculty member Dr. Jeffrey Chancellor in August 2019. Our researchers published more than 14 peer-reviewed scientific articles, and our students and faculty continued to receive awards, honors and extramural funding. The program remains large by our historical standards, with 27 students currently enrolled, and the program is fully staffed. You will find more on these and other news stories inside this issue.

Teamwork was essential to meeting challenges in faculty research laboratories. No less than four students in my laboratory graduated within a 6-week period. Our team managed the logistical challenges of finishing the science projects on schedule and the students started their new positions right on schedule. Chris Schneider (PhD) accept a residency training position at MBPCC, Will Donahue (PhD) accepted a combined residency and post-doctoral fellowship at Yale, Lydia Wilson (PhD) accepted a post doctoral fellowship at St Jude Childrens' Research Hospital, and Margaret Carey (BS) entered LSU Medical School. Another student, Michelle Lis, is finishing up a multi-year stint in Darmstadt, Germany, where she is completing her PhD research project on heavy ion therapy. These are all exceptional individuals, yet together they are representative of our students and alumni. They come to us from all over, many remain in Louisiana to live and work, and others take positions at leading institutions around the globe. We are proud of our alumni and we strive to make them proud of their *alma matter*.

As ever, we are grateful to our partners and collaborators at Mary Bird Perkins Cancer Center, Pennington Biomedical Research Center, and elsewhere for their support. We are also grateful to many generous donors in 2019. This issue contains an update on our highly successful fundraising campaign to endow a scholarship for graduate students. The scholarship is named after, Dr. Kenneth R. Hogstrom, my predecessor, in honor of his outstanding career and scientific contributions to radiation therapy. If you have already contributed to this fund, thank you. If you haven't yet had the opportunity to do so, please do so now (see back page for details).

Drop us a line and stay in touch. We look forward to hearing from you!

Wayne Newhauser



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2. Trainee Milestones

2.1 Graduations

Please join us in welcoming these ten outstanding individuals as alumni of our Medical Physics and Health Physics Graduate Education Program. Alumni, please stay in touch and let us know how you are doing.



Amin Hamideh
MS-Health Physics

Advisor: Dr. Wei Hsung Wang
Graduation: Spring 2019
Job: LSU Radiation safety office



Cameron Sprowls
MS-Medical Physics

Advisor: Dr. Jonas D. Fontenot
Graduation: Spring 2019
Job: Therapeutic Radiologic
Physics Resident at University of
Florida Health Cancer Center –
Orlando



Bethany Broekhoven
MS – Medical Physics

Advisor: Dr. Kenneth Matthews
Graduation: Summer 2019
Job: Medical Physics Resident at
Medical University of South
Carolina in Charleston



Garrett Otis
MS-Health Physics

Advisor: Dr. Wei-Hsung Wang
Graduation: Summer 2019
Job: Health physicist at
Yale-New Haven Hospital



Hanif Soysal
MS-Medical Physics

Advisor: Dr. Joyoni Dey
Graduation: Summer 2019
Job: Medical Physics Resident at
University of Mississippi Medical
Center



Lydia Wilson Jagetic
PhD-Medical Physics

Advisor: Dr. Wayne Newhauser
Graduation: Summer 2019
Job: Post-doctoral fellowship at St.
Jude Children's Hospital in Memphis



William Donahue
PhD-Medical Physics

Advisor: Dr. Wayne Newhauser
Graduation: Summer 2019
Job: Residency training fellowship at Yale in New Haven, Connecticut



Christopher Schneider
PhD-Medical Physics

Advisor: Dr. Wayne Newhauser
Graduation: Summer 2019
Job: Residency at Mary Bird Perkins Cancer Center, Baton Rouge



Daniel Dimarco
MS-Health Physics

Advisor: Dr. Kenneth Matthews
Graduation: Fall 2019
Job: Health physicist at Nuclear Regulatory Commission, Washington DC



Anthony Davila
MS-Health Physics

Advisor: Dr. Wei Hsung Wang
Graduation: Fall 2019
Job: Radiation Safety Specialist at Tulane University, New Orleans



PhD Christopher Schneider celebrates graduation with advisor Dr. Wayne Newhauser

2.2 Certifications

Congratulations to all students who have made progress in achieving certification. The following students have chosen to disclose their professional certification progress achieved in 2019.



Payton Bruckmeier
PhD - Medical Physics
Passed Part I of the ABR Exam



Chia-Lung Chien
PhD - Medical Physics
Passed Part I of the ABR Exam



Audrey Copeland
MS - Medical Physics
Passed Part I of the ABR Exam



Troy Jacobs
MS - medical physics
Passed Part I of the ABR Exam



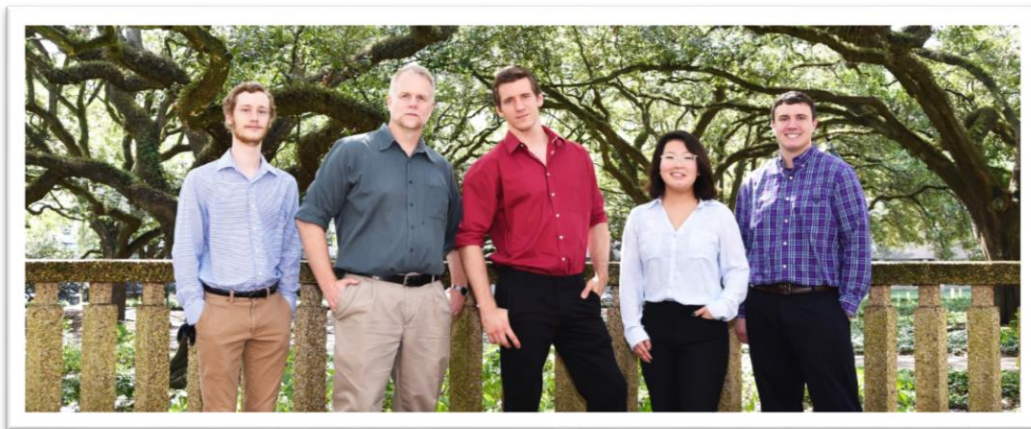
Krystal Kirby
PhD-Medical Physics
Passed Part I of the ABR Exam



Andrew McGuffey
MS-Medical Physics
Passed Part I of the ABR Exam

2.3 Matriculations

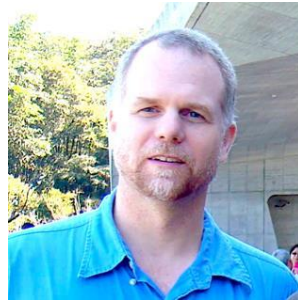
The program welcomed 5 outstanding new medical & Health physics students, who entered the program in the fall of 2019.



Our new students pose for a picture under the beautiful live oaks at the LSU Student Union. Observe how they are suffering with considerable stoicism through another day of Louisiana's winter weather.



Reagan Dugan
PhD - Medical Physics BS/2019/
Missouri Univ. of Science &
Technology



Michael McMahon
MS-Health Physics BS/1993/
Louisiana State Univ.



Elizabeth Park
MS-Medical Physics
BS/2019/ Missouri Univ. of Science
and Technology



Michael Taylor
MS-Medical Physics BS/2019/
University of West Florida



Charles Zimmerman
MS-Medical Physics BS/
2019/University of Utah



2018 and 2019 Medical & Health Physics graduate students enjoying a moment of levity outside the Student Union.

3. Featured Stories

3.1 New Faculty Jeffrey Chancellor Joins the Program

Join us in welcoming Dr. Jeff Chancellor to the program. He joined our faculty in August, 2019, as a tenure-track assistant professor and has established a new research laboratory here at LSU. He is an expert consultant on radiation effects for manned spaceflight and the aerospace industry. His research utilizes 3D Monte Carlo modeling techniques and high-performance computer platforms to study heavy charged particle interactions with soft tissue and condensed matter following space radiation exposures. His laboratory, the Space Radiation Transport & Applied Nuclear Physics (SpaRTAN) Group, is focused on applications of how heavy ion radiation interacts with soft and condensed matter for ground-based analogs, manned spaceflight vehicle structure, shielding, and clinical healthcare. The SpaRTAN lab utilizes high-performance, multi-core computers and sophisticated numerical techniques for studying complex dynamics that are otherwise difficult to mimic in a laboratory setting. Prior to LSU he was a research scientist in the Computational Physics Group at Texas A&M University.



Previously, Chancellor was the Radiation Effects Program Manager at the National Space Biomedical Research Institute and held an academic appointment at the Center for Space Medicine at Baylor College of Medicine. Much of his research drive is from his experience as a Senior Research Engineer with the Space Radiation Analysis Group (SRAG) at NASA's Johnson Space Center. As part of SRAG, he served as a Flight Controller on the Radiation Console in Mission Control and as the Radiation Lead on the Mission

Management team for Space Shuttle mission STS-118, STS-120, STS-122, and STS-125 (Hubble repair mission). This included projecting the radiation exposure, briefing the astronaut crew on any health risks associated with mission, exposures informing the Mission Manager of the radiation risk assessment and providing a Go/No-Go recommendation. Additionally, Jeff also provided training in space weather, medical physics, and countermeasure procedures to astronauts preparing for missions on the International Space Station. He worked extensively with the design team for the Constellation Program's Orion Crew Exploration Vehicle in the effort to reach an optimum mass configuration that would maximize the shielding during solar particle events.

According to Wayne Newhauser, the recruitment of Chancellor was made possible by a faculty development grant from the US Nuclear Regulatory Commission. "The grant, along with considerable matching funds and other support from the Provost's Office, the Office of Research and Economic Development, the College of Science, and the Department of Physics and Astronomy, made this possible. We are truly grateful for this support. The program can only reach its full potential when it is staffed appropriately. I am confident that Dr. Chancellor will meet or exceed LSU's high expectations. Although he has been here less than a year, he is already making excellent progress in his research and teaching activities."

3.2 NCI Grant Award for Technology Transfer of Intensity-Modulated Bolus Electron Conformal Therapy

The Mary Bird Perkins Cancer Center (MBPCC) Electron Beam Therapy Physics Research Group, in collaboration with .decimal, LLC, was successful in receiving a two-year, \$2 million Phase II, Small Business Innovation Research (SBIR) grant commencing September 24, 2019, from the National Cancer Institute (NCI) for Product Development of Intensity Modulation for Bolus Electron Conformal Therapy. The Phase II grant is an extension of a \$246 thousand Phase I, Small Business Technology Transfer (STTR) grant, which it completed in September 2018. Kevin Erhart, PhD, President and Chief Technology Officer for .decimal, is the grant's principal investigator, and Kenneth Hogstrom, PhD, Senior Medical Physics Advisor, is principal investigator of the subcontract with MBPCC, .decimal's research partner.

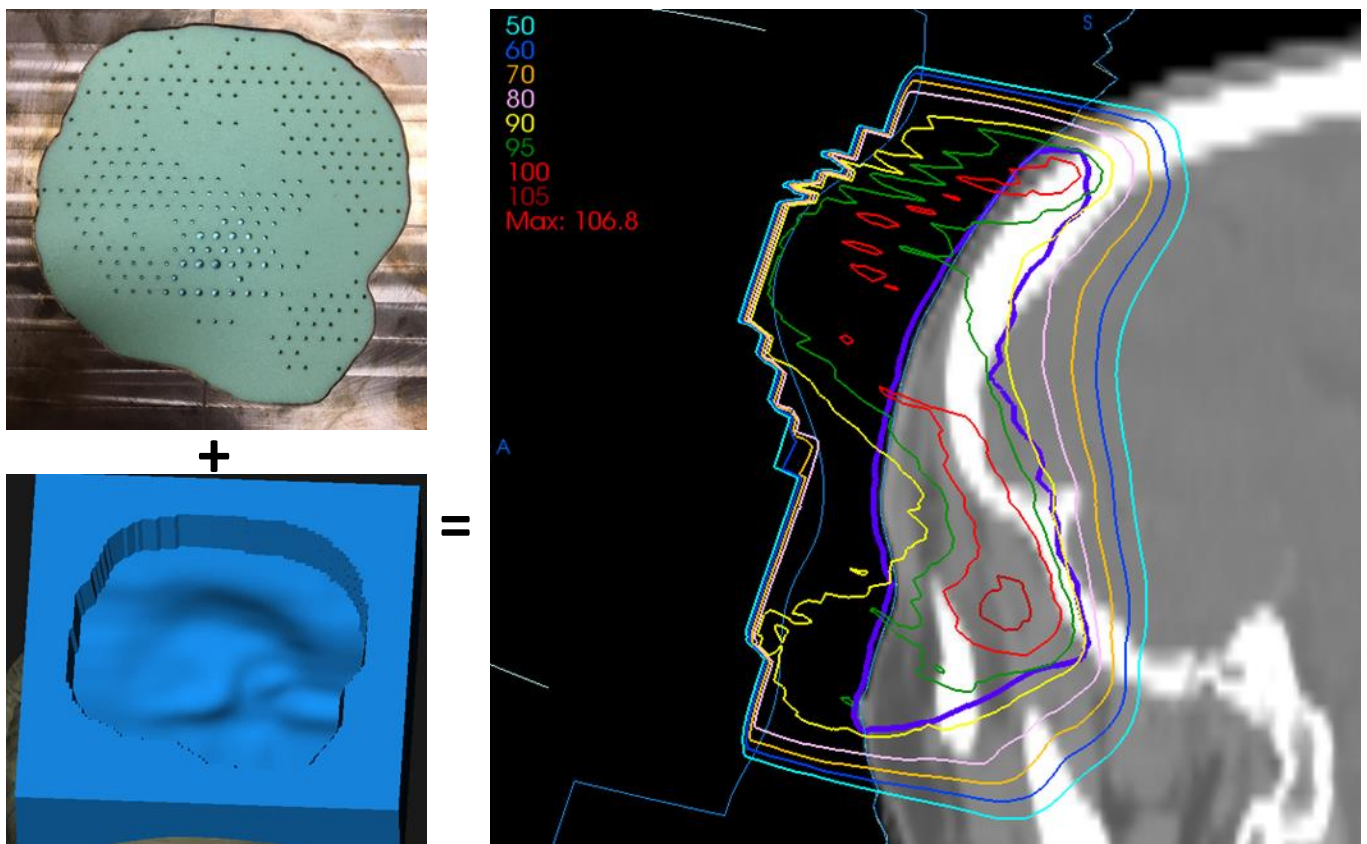
The Phase II grant was awarded based on a promising proposal and successful results of the Phase I grant, which included contributions from three LSU MS in Medical Physics graduate student theses: Erin Chambers (2016) "Design of a Passive Intensity Modulation Device for Bolus Electron Conformal Therapy", John Doiron (2017) "Benefit of Intensity Modulated Bolus Electron Conformal Therapy for Post Mastectomy Radiotherapy", and Elizabeth Hilliard (2018) "Verification and Evaluation of a Passive Intensity Modulation Device for Bolus Electron Conformal Therapy". In the Phase II grant, MS graduate student Joseph Scotto will be supervised by Dr. Garrett Pitcher for Aim 1 "Model electron scatter into and from island blocks", and PhD graduate student Andrew McGuffey will be supervised by Dr. Robert Carver for Aim 2 "Validate IM-BECT dose delivery in anthropomorphic phantoms". Aim 6 "Refine methods for factory and clinical PRIME quality assurance (QA)" is also planned to utilize a future graduate student.

Aim 3 of the grant "Develop an electron specific TPS (COMET-Plan) for IM-BECT", to be performed by .decimal engineering staff, should result in an unprecedented, electron beam therapy planning system, which will not only plan intensity-modulated bolus electron conformal therapy (IM-BECT), but also efficiently and effectively manage personalized electron therapy tools such as cutouts, skin collimation, eye shields, and bolus. Dr. Erhart states, "This project will leverage .decimal's personalized electron therapy tools, which is possible due to its company's expertise in machining

custom treatment devices and its prior development of a proton planning system (Astroid) and electron conformal bolus design software (p.d).” In Aim 4 of the grant “Evaluate clinical utility of COMET-Plan software,” MBPCC clinical staff will have opportunity to evaluate and provide feedback on software development. Dr. Hogstrom states, “We are very excited about the opportunity to see a clinical electron planning system being developed that is on par with those of other radiotherapy modalities and that easily plans using personalized devices.”

Aim 5 of the grant “Discover the clinical utility of IM-BECT” will be a multi-institutional, retrospective treatment planning study that will compare IM-BECT and BECT dose plans to determine sites where IM-BECT gives the greatest reduction in dose spread with comparable normal tissue risks. This clinical study will include research partners at Washington University in St. Louis (James Kavanaugh, MS and Mackenzie Daly, MD), The University of Texas M D Anderson Cancer Center (Rajat Kudchadker, PhD and George Perkins, MD), Orlando Health University of Florida Health Cancer Center (Sanford Meeks, PhD and Patrick Kelly, MD, PhD), and MBPCC (Connel Chu, MS and Robert Fields, MD).

Upon completion, .decimal is expected to provide future electron therapy patients access to state-of-the-art techniques such as IM-BECT, personalized electron therapy tools, and highly accurate, fast dose calculations. This will offer the potential for reduced normal tissue complications and secondary cancer risks to patients with superficial cancers.



Intensity modulator (upper left) consists of .decimal copper cutout containing a low-density foam insert embedded with tungsten cylindrical island blocks of variable diameters. Conformal electron bolus (lower left) is machined using blue machineable wax. Together, the two can deliver the intensity modulated bolus electron conformal therapy (IM-BECT) patient plan (right); PTV is purple contour. (from Hilliard 2018; patient data provided by alumni James Kavanaugh of Washington University in St. Louis)

3.3 Health in High Resolution: Better Diagnostic Imaging Developed at LSU

Reprinted with permission from an article by Elsa Hahne, LSU Office of Research & Economic Development

Joyoni Dey, assistant professor in the LSU Department of Physics & Astronomy, received a LIFT² innovation and technology transfer grant from the LSU Board of Supervisors back in 2017 to improve X-ray and medical imaging for lung, breast, and bone scans, with the potential to save lives. The emerging technology can potentially detect and diagnose tumors where conventional imaging techniques cannot. Dey has also received additional support through the Louisiana Board of Regents and has her second patent pending, this time for phase contrast X-ray interferometry:

“Compared to conventional imaging, we’re trying to achieve better quality diagnostic images that are higher in contrast, while preserving the resolution and keeping the dose and radiation exposure as low as possible for the patient. I’m working on this emerging technology together with my Ph.D. student, Jingzhu Xu.



“While conventional imaging for X-ray and CT scans looks at the attenuation of photons as they travel through the body—more attenuation in bone, less in tissue—we’re providing two additional modalities, which are phase-shift and small-angle-scatter. We can observe both the attenuation and phase-shift, that is, observe the total refraction

index in tissue. Scatter can give us complimentary and higher contrast images as well, particularly in the lungs.

“Several X-ray interferometers already exist. They have shown improvements over conventional X-rays in terms of identifying breast tumors, classification of micro-calcifications—whether they’re malignant or not—as well as improving specificity of lung diseases, such as fibrosis, emphysema, and lung cancer. Our interferometry system is built from a special modulated phase grating and does not require an absorption grating as needed in interferometers at the forefront. Our system is different from state-of-the-art X-ray interferometers in that the extra phase and scatter information can be obtained at a dose of radiation no higher than a regular X-ray. Our system, if successful, could be used as a powerful screening tool.

“We’re focusing on the breast right now. Breast cancer affects 1 in 8 women, and I was always interested in breast imaging, its applications, and the challenges of interferometry. Also, we have two interferometers available at LSU for us to use, which we can adapt for this research. When our system is fully developed, with the extra modalities on same scan requiring no extra dose to the patient—we will potentially be able to identify tumors where conventional X-ray imaging cannot, providing both higher disease detection sensitivity and specificity. Earlier disease detection and treatment is known to improve survival rates, not just for breast cancer, but for lung cancer as well,

which is the highest killer in the U.S. right now. Our technology, once it goes to the clinic, has the potential to save lives. In a nutshell, we can help clinicians visualize lung and breast tissue, as well as bone and cartilage, and potentially give them much better information about a particular disease.

“I’m now getting ready to resubmit our R21 grant application to the NIH this November. We got very good feedback in the last round, so I’m hopeful.”

3.4 The Art of Science: Gallery Showcases Cancer, Bacteria Design by Meagan Moore

Reprinted with permission from an article by Libby Haydel, November 12, 2019

BATON ROUGE, LA – The art of LSU Biological Engineering senior Meagan Moore will be featured as part of “Metis-Muses: Women of Art Through Science” at The Healthcare Gallery and Spa in Baton Rouge through Jan. 21.

As a BE student, Moore is known in the college for her design of “Marie,” a 3D-printed, 5-foot-1-inch purple model used for cancer radiation therapy research. The life-size “Marie” will be part of Moore’s art display, along with other pieces inspired by her cancer research. One work, called “Cancer Mandala,” features a smaller model of “Marie” in front of a mandala, a geometric figure representing the universe in Hindu and Buddhist symbolism. “Cancer Mandala” combines data Moore collected from the various particle accelerators used in her research with histological image samples of different types of cancer.

“Mandalas are made by monks to guide practitioners to enlightenment and are often painted, woven, made of sand, and sometimes 3D,” Moore said. “The destruction of the sand mandala is a highly ceremonial process, where the piece is parted out and released back into nature. Similarly, certain cancer treatments literally and metaphorically take a person apart or remove the cellular issues manifesting within the physical form.”

The outermost layers of the mandala include various graphs and functions that are utilized to propagate therapeutic beams and function as part of the “tool box” of a medical physicist. Moving inward, there are a series of concentric circles, based on data collected in Moore’s research, representing the regions of interest that were tested on the full-scale “Marie.” Starting from the outer four rings, the data for the thyroid is parted out, with each circle representing a different machine utilized to collect data and the amount of dose-per-dose gray done at varying field sizes. The innermost rings represent the breast/chest, pacemaker and fetus. The small model of “Marie” at the center was used in the prototyping process to design and build the full-scale model.



Another of Moore's pieces, "Marine Snow: Diatoms, Radiolarians, Dinoflagellates," features resin and acrylic pieces designed to represent actual marine snow, a continuous lilt of organic material that falls from the upper surface waters of the ocean to the depths where this is little to no sunlight. Moore scanned electron microscopy images of diatoms, dinoflagellates and radiolarians to create this piece, which sits on a backlit box that provides color coding to gallery visitors.

Her "Apoptosis" piece "seeks to analyze the calculated death that cells can undergo," Moore said. The central focus is an apoptosome, which is a large quaternary protein structure formed in the process of apoptosis, which is cell death. The circular facets of this mandala are composed of the genetic code of the apoptosome.

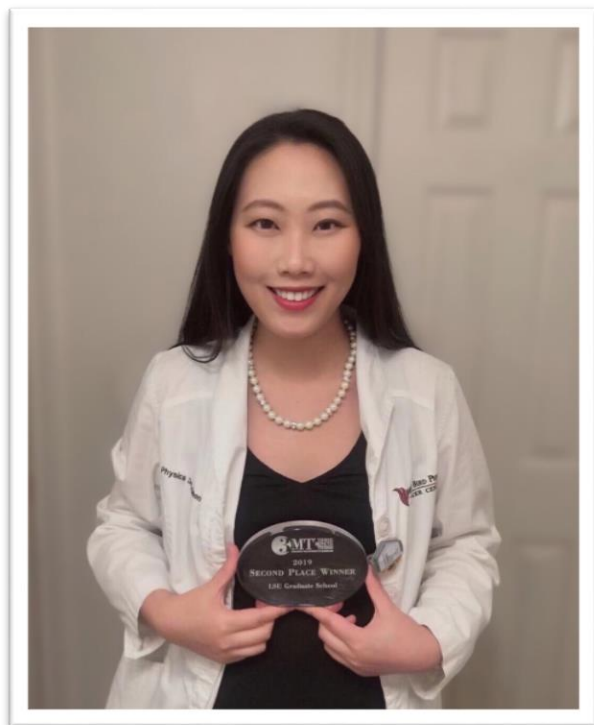
Other pieces by Moore include a Petri dish with images shaped out of bacteria, one of which is a bee called "The Most Important Species on Earth."

"This piece focuses on bees, which were recently acknowledged to be the most important species on Earth," Moore said. "I hope this piece will imbue a sense of the importance of 'bee-ing' rather than seeming and perhaps an enchanting notion to explore the worlds that make our very world exist."

Moore credits Claire Luikart, Cathlin Disotell and Mary Miller for helping her with these pieces.

The Healthcare Gallery and Spa is located at 3488 Brentwood Drive, Suite 103. The gallery is open to the public during spa business hours, Monday-Friday, 9 a.m.-5 p.m.

3.5 PhD Student Zhao Won 2nd Place in Thesis Competition



The Three Minute Thesis (3MT®) is an international research communication competition. The exercise challenges Masters and Ph.D. students to present a compelling oration on their thesis topic and its significance in just three minutes. 3MT® develops academic, presentation and research communication skills and supports the development of research students' capacity to effectively explain their research in language appropriate to a non-specialist audience. LSU hosted the completion at the week of November 12-15, 2019 at the Digital Media Center Theater.

Our Medical Physics PhD student Xiaodong Zhao won the 2nd place in the final round and received \$750 travel award. She is working under the supervision of Dr. Rui Zhang. Congratulations Xiaodong and keep up the great work!

Read more at

<https://www.lsu.edu/graduateschool/3mt.php>

3.6 Newhauser named President-Elect of SDAMPP

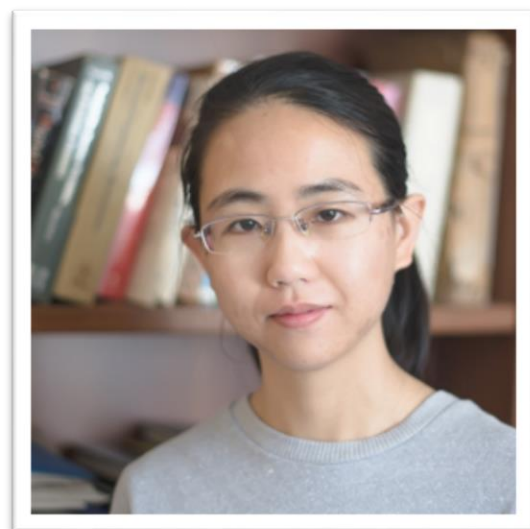
Wayne D. Newhauser, our Program Director and holder of the Dr. Charles M. Smith Chair of Medical Physics, was elected to the office of President-Elect of the Society of Directors of Academic Medical Physics Programs (SDAMPP). The society is devoted to advancing medical physics education and its membership includes directors of medical physics graduate education and residency programs in North America. Newhauser was previously elected to the society's Board of Directors and served as Secretary until recently.



According to Newhauser, “On hearing the election results, I was both excited and humbled. Excitement comes from all the opportunities we have to work together to make medical physics education even better than it is today. It is always a bit humbling to be elected by one’s colleagues, many of whom are more senior or more experienced.” Newhauser explained several of the benefits of being involved in SDAMPP, including “access to advance information pertaining to items that impact our students and faculty, such as curriculum recommendations, accreditation standards, and numerous other practical issues that faculty and students will eventually have to face. The world of higher education is changing very rapidly and there is a lot for program directors to keep on top of. The sooner we know about coming changes, the better able we are to navigate them.” Newhauser deflected any suggestion of a personal accomplishment, noting “Apparently, the society’s members want to elect leaders from strong, well run programs. Fortunately, the LSU/MBPCC fits that profile, thanks to years of amazing teamwork and sustained institutional support.”

3.7 PhD Student Received Coates Research Scholar Award

Medical Physics PhD student Jingzhu Xu received the prestigious 2019 Coates Research Scholar Award. The award was made from the Dr. Charles E. Coates Memorial Fund. These competitive awards are made to support promising doctoral research by superior graduate students. The award is for \$5000/year, with a possibility of a second year of funding, based on future availability of funds. Jingzhu’s research focuses on a study of Multiple Contrast Breast CT. The group designed a novel clinical compatible method of X-ray interferometry to acquire three imaging contrast modalities simultaneously to improve soft tissue contrast. This technology can help to boost the diagnostic efficiency with Cone Beam Breast CT for breast tumors at early stage. Jingzhu works under the supervision of Dr. Joyoni Dey.



3.8 Proton Radiotherapy Physics Workshop

A group of LSU students and MBPCC residents attended the Proton Radiotherapy Physics Workshop on November 15-16, 2019 at Shreveport, Louisiana. They heard many talks throughout the day and the students got a personalized tour of the Willis-Knighton Cancer center and proton gantry. We are grateful to our colleagues at Willis-Knighton for this educational opportunity.



3.9 Residency Program Update

In 2019 Mary Bird Perkins matriculated their 11th class of physics residents. The program has undergone considerable growth and evolution since admitting its first resident in 2009. From the beginning, the program was geared toward admitting students completing graduate degrees in medical physics from the LSU/MBPCC graduate program. In 2011, MBPCC established a consortium that today includes the Willis Knighton Cancer Center (WKCC) in Shreveport and the University of Mississippi Medical Center (UMMC) in Jackson, MS. CAMPEP Accreditation for the Consortium Program was initially awarded in 2012.

To date, the Consortium Program has produced a total of 33 graduates, 15 which were graduates of the LSU/MBPCC graduate program in Medical Physics. Residency program graduates have experienced 100% placement into career positions, and 97% of eligible candidates have become board certified in therapeutic medical physics by the American Board of Radiology (ABR). Graduates of the residency program hold medical physics positions at academic centers, community oncology centers, private practice groups, and industrial companies across the country, from Anchorage to Miami.

According to Jonas Fontenot, who serves as director of the MBPCC residency program, “Each year, the Program typically receives about 90 applications for admission. From those applications, the Program admits 4 new residents, 2 at MBPCC and 1 each at WKCC and UMMC. Positions are filled through a national match process that continues to provide priority admission to our graduate students.” The importance of this program to the graduate program was underscored by Wayne Newhauser, who noted that “The availability of residency training slots at MBPCC is important to our prospective graduate students. They know how competitive residency admissions are, and having access to the MBPCC residency training been a big motivating factor to attend the LSU graduate program.”

The Program's curriculum prepares residents for the demanding technical and professional requirements of contemporary radiation oncology. According to Fontenot, "Importantly, each and every resident in our Program is called upon to make important contributions to their clinics that support patient care programs at their home institution throughout their time in the program. The training is difficult and rigorous, but our residents invariably rise to the challenge and become key members of the patient care team. Ultimately, the training our residents receive and the experience they gain during their time in the program can propel them into many different types of career positions that match their goals and interests. We are proud of our graduates and Program!"



2019 Graduates (L-R): John Doiron, who previously earned his MS from LSU, degree took a position at HannLeb Physics, Inc. - Johnson City, TN and Abingdon, VA (Ballad Health Care System). Fei Duan, MS took a position at 21st Century Oncology, Wellington, FL. Nick Marsh, MS took a position at Ironwood Cancer and Research Center, Chandler, AZ. Brittany (Moore) Earl, MS took a position at McLeod Regional Medical Center, Florence, SC.

3.10 Hogstrom Scholarship Opens New Opportunities

Reprinted with permission from LSU Media Center 07/02/2019

https://www.lsu.edu/mediacenter/news/2019/07/02physastro_regents_hogstromscholarship.php

Due to significant student achievements, outstanding faculty and medical physics program education quality, the Louisiana Board of Regents, or BOR, has granted five sets of matching funds to the Kenneth R. Hogstrom Superior Graduate Student Scholarship fund, which provides support for the Mary Bird Perkins Cancer Center–LSU joint medical physics program.

Established in honor of Kenneth R. Hogstrom's outstanding research, scholarship and mentorship of graduate students, the Kenneth R. Hogstrom Superior Graduate Student Scholarship supports medical physics graduate students participating in leading-edge radiation oncology clinical research at Mary Bird Perkins Cancer Center, while earning their MS or PhD from LSU.

As a highly acclaimed educator and researcher, Hogstrom has had a remarkable impact on practice in the field of radiotherapy. Hogstrom 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.

"One of the greatest phases of my career has been working with my colleagues at Mary Bird Perkins and LSU and establishing one of the most respected medical physics training programs in the country," said Hogstrom, who is an LSU Department of Physics & Astronomy professor emeritus and senior medical physics advisor at Mary Bird Perkins. "The funds, which we have

received annually over the last several years, demonstrate the Board of Regents’ belief in the strength of this program and its importance to the national healthcare community in producing the highest quality medical physics professionals in the country.”

Having now received over \$500,000 — more than \$300,00 from donors and \$200,00 from BOR grants — since the establishment of the endowed fund in 2015, it is now feasible to award its first medical physics graduate student scholarship in 2020.

The Mary Bird Perkins–LSU Medical Physics partnership provides for a multi-layered joint academic and research program between the two organizations. Created in 2004, it leverages the educational and research resources of LSU and the cancer expertise of Mary Bird Perkins to benefit patients receiving cancer care in southeast Louisiana and beyond. The partnership supports an MS program, PhD program and residency program within this elite and highly specialized discipline, and continues to attract the brightest minds from around the world.

“We appreciate the Board of Regents’ recognition of our joint program through this award,” said Jonas Fontenot, chief of physics and chief operating officer, Mary Bird Perkins Cancer Center, and LSU Department of Physics & Astronomy adjunct professor. “It is because of this type of support and the generosity of the community that we are able to continue advancing cancer care at such a rapid pace. There are many opportunities for individuals, corporations and others to help make a difference in this nationally recognized medical physics training program.”

3.11 New Radiation Oncology Physics Journal Club

In 2019, graduate students and faculty formed a journal club focusing on technology, applications, and interventions in radiation oncology. It is held once per month at Mary Bird Perkins Cancer Center and seeks to develop a friendly community where students and faculty can gather to discuss, challenge, and encourage collaboration with each other through the presentation of new research material. The club allows graduate students to practice their skills and to give and receive constructive criticism on research topics through lively discussion.



According to David Solis, who leads the club, nearly 20 members attend. In December the club hosted a pizza party to brainstorm topics for future club meetings. Future topics from the list include: FLASH therapy, MR-Simulation, machine learning and deep learning techniques in

medical physics, the economic considerations of radiation therapy, new advances in heavy-ion radiotherapy, and many more.

3.12 Winter Holiday Open House

The Newhausers welcomed students, faculties, and colleagues at their house for the Medical Physics and Health Physics Annual Winter Holiday. With final exams having just ended, everyone was happy to relax, mingle, enjoy delicious food, and watch the LSU football game together. LSU won the SEC Championship that night! A new addition this year was the making of traditional mulled german wine. It was so delicious and its warm glow helped take the chill out of the evening air.



4. Honors and Awards

1. Dr. Newhauser has been named president-elect of SDAMPP.
2. PhD student Xiaodong Zhao won 2nd place in LSU's 3-min thesis competition.
3. PhD Students Jingzhu Xu Received \$5000 Coates Research Scholar Award.
4. MS student Stephanie Wang received \$10,000 inaugural Kenneth R. Hogstrom Superior Graduate Student Scholarship.

5. Medical and Health Physics Program in the News

- Our newly hired assistant professor Dr. Jeffery Chancellor in safety and health magazine: "Deep-space radiation may impair astronauts' cognitive function: study" Read more: <https://www.safetyandhealthmagazine.com/articles/18975-deep-space-radiation-may-impair-astronauts-cognitive-function-study?fbclid=IwAR2AhxnRyvMCUSyfRQNsOzS77f-4fxkZJxUkyJTFpOUHixB1HN8Pbhgr2IE>
- Previous intern Jasmine Jones in the video from Chicago: "Black women in STEM" . Jasmine Jones did a summer REU (research experiences for undergraduates) project with Dr. Rui Zhang in 2015. The research project is about calibrating the high-density magnetic port within breast tissue expanders to achieve more accurate dose calculations for post-mastectomy patients with immediate breast reconstruction.
Based on her work, she won the 2nd place in the Oral Presentation Competition at LSU Undergraduate Research Conference and the 1st place in Biophysics Category, Gulf Coast Undergraduate Research Symposium held at Rice University in 2015. Her abstract, in which she served as the first author, was also accepted by the Women in Physics Conference in San Antonio and the American Physics Society March Meeting in Baltimore in 2016.

6. Selected Publications

1. P. Wall and J.D. Fontenot, "[Evaluation of complexity and deliverability of prostate cancer treatment plans designed with a knowledge-based VMAT planning technique](#)," J Appl Clin Med Phys. 2019 Dec 9. doi: 10.1002/acm2.12790.
2. Krystal M. Kirby, Sreekrishna Ramakrishna Pillai, Owen T. Carmichael, and Arend W. A. Van Gemmert. [Brain functional differences in visuo-motor task adaptation between dominant and non-dominant hand training](#). Experimental Brain Research volume 237, pages 3109–3121 (2019).
3. N. Bhusal, J. Dey, J. Xu, K. Kalluri, A. Konik, J. M. Mukherjee, P. H. Pretorius, "[Performance Analysis of a High-Sensitivity Multi-Pinhole Cardiac SPECT System](#)", Medical Physics vol. 46, no. 1, pp. 116-126, Jan 2019.

4. Lydia J. Wilson , Wayne D. Newhauser Christopher W. Schneider. “[An objective method to evaluate radiation dose distributions varying by three orders of magnitude](#)” Med. Phys. 46 (4), April 2019.
5. Steve Braunstein; Li Wang; Wayne Newhauser ; Todd Tenenholz; Yi Rong; Albert van der Kogel; Michael Dominello; Michael C. Joiner; Jay Burmeister“[Three discipline collaborative radiation therapy \(3DCRT\) special debate: The United States should build additional proton therapy facilities.](#)”J. Appl Clin Med Phys 2019; 20:2: 7-12.
6. Blue RS, Chancellor JC, Suresh R, Carnell LS, Reyes DP, Nowadly CD, Antonsen EL. [Challenges in Clinical Management of Radiation-Induced Illnesses During Exploration Spaceflight](#). Aerosp Med Hum Perform. 2019 Nov 1;90(11):966-977.
7. Blue RS, Chancellor JC, Antonsen EL, Bayuse TM, Daniels, VR, Wotring, VE, [Limitations in Predicting Radiation-Induced Pharmaceutical Instability during Long-Duration Spaceflight](#). Nature Microgravity, Jun;5(1) (2019).
8. Chancellor JC, Guetersloh SB,Cengel KA, Ford J, Katzgraber HG, [Targeted nuclear spallation from moderator block design for a ground-based space radiation analog Nature Microgravity](#), submitted(arXiv:1706.02727v2) (2019).
9. SA, Y., Zhang, R. (2019). [An atlas-based method to predict three-dimensional dose distributions for cancer patients who receive radiotherapy](#). Physics in Medicine and Biology, 64(8): 085016.
10. Xie, Y., Bourgeois D., Guo, B., Zhang, R. (2019). [Post-mastectomy radiotherapy for left-sided breast cancer patients: comparison of advanced techniques](#). Medical Dosimetry, in press.
11. Pandey, A., *SA, Y., Guo, B., Zhang, R. (2019). [Feasibility of generating synthetic CT of brain from T1-weighted MRI using a linear mixed-effects regression model](#). Biomedical Physics & Engineering Express, 5, 047004.
12. Schneider CW, Newhauser WD, Wilson LJ, Kapsch RP. [A physics-based analytical model of absorbed dose from primary, leakage, and scattered photons from megavoltage radiotherapy with MLCs](#). Phys Med Biol. 2019 Sep 19; 64 (18):185017.
13. M. F. Moyers, T. Toth, R. Sadagopan, A. Chvetsov, J. Unkelbach, R. Mohan, D. Lesyna, L. Lin, Z. Li, F. Poenisch, W. Newhauser, S. Vatnitsky, J. B. Farr. [Physical uncertainties in the planning and delivery of light ion beam treatments: Report of AAPM Task Group 202](#). American Association of Physicists in Medicine
14. Naseri M, Rajabi H, Wang J, Abbasi M, Kalantari F, “[Simultaneous respiratory motion correction and image reconstruction in 4D-multi pinhole small animal SPECT](#)” Med Phys. 2019 Nov;46(11):5047-5054. doi: 10.1002/mp.13807. Epub 2019 Sep 21.

7. Seminars and Presentations

1. Hamideh AM, Wang W-H. Using barium-133 as a surrogate for iodine-131 in a silver zeolite cartridge for air sampling. The 5th International Conference on Environmental Radioactivity, September 8-13, Prague, Czech Republic, 2019.

2. Wang W-H, Robinson J, Hamideh AM. Investigation of elevated radiation exposure from debris of a renovation project. The 5th International Conference on Environmental Radioactivity, September 8-13, Prague, Czech Republic, 2019.
3. DiMarco DJ, Matthews II KL, Wang W-H. Visualization of radioiodine distribution in silver zeolite cartridges with gamma-ray imaging. The 64th Annual Meeting of the Health Physics Society, July 7-11, Orlando, FL, 2019.
4. Robinson J, Hamideh AM, Wang W-H. Response to a spill involving lutetium-177 in a radiation use facility. The 64th Annual Meeting of the Health Physics Society, July 7-11, Orlando, FL, 2019.
5. Davila AD, Fletcher JF, Matthews II KL, Wang W-H. Evaluating feline release criteria following iodine-131 treatment for hyperthyroidism. The 64th Annual Meeting of the Health Physics Society, July 7-11, Orlando, FL, 2019.
6. Kirby, K., Pillai, S., Brouillette, R., Keller, J., De Vito, A., Bernstein, J., Van Gemmert, A. W., Carmichael, O. T. "Performance and brain activation in a dual task mimicking distracted walking." Alzheimer's Imaging Consortium at the Alzheimer's Association International Conference, Los Angeles, CA, July 2019.
7. Kirby, K., Carmichael, O., Van Gemmert, A. "Brain activation changes as a result of bilateral transfer of a visuomotor task." Presented as an oral blitz presentation at the Pennington Biomedical Scientific Retreat, Baton Rouge, LA, May 2018. Phillip DH Wall and Jonas D Fontenot. VMAT plan complexity feature analysis for predicting quality assurance outcomes using forests of extremely randomized decision trees. AAPM Annual Meeting, 2019.
8. Lis, Donetti, Steinsberger, Wolf, Paz, Newhauser, Durante, Graeff. A clinical quality assurance concept for conformal motion-synchronized dose delivery system used for four-dimensional ion therapy.
9. M.Lis, W.Newhauser, "Experimental validation of conformal motion mitigation in particle therapy". RRS Annual meeting, 1-6th November. San Diego, California, USA
10. M.Lis, W.Newhauser, M.Wolf, M.Donetti, C.Graeff. " Experimental feasibility of motion-synchronized ion beam delivery" DGMP Annual meeting, 18-21 September. Stuttgart, Germany
11. M. Lis, M. Donetti, C. Sauter, M.Wolf, C. Graeff, W. Newhauser. "A Modular Control System for Treating Moving Targets with Scanned Ion Beams: Design, Development, and Preliminary Test Results". OMA International Conference on Medical Accelerators and Particle Therapy, 4-6th September. Seville, Spain
12. M. Lis, W. Newhauser, M. Donetti, C. Graeff, " Implementation and first tests of the CNAO dose delivery system at GSI." Poster at PTCOG58, 10-15th June, 2019. Manchester.
13. Phillip DH Wall and Jonas D Fontenot. VMAT plan complexity feature analysis for predicting quality assurance outcomes using forests of extremely randomized decision trees. AAPM Annual Meeting, 2019.
14. Chancellor, JC. "The Operational Space Radiation Environment and Mitigation Strategies." Department of Defense (DoD) Radiation Working Group, Defense Health Headquarters, Washington, D.C. June 2019

15. Chancellor, JC. "The Operational Space Radiation Environment." NASA Exploration Medical Capabilities (ExMC) Technical Interchange Meeting. Johnson Space Center, Houston, TX. June 2019
16. Chancellor, JC. "Radiation is Hard: Challenges of Pathogenesis and Translation into Clinical Outcomes." Principles of Aerospace Medicine Short Course, University of Texas Medical Branch, Galveston, TX. June 2019
17. McGuffey, A. and Sick, J. "Evaluation of an In-House Respiratory Tracking System for Phase Binning of Elekta Machine Log-File Control Points". AAPM Annual Meeting, San Antonio, TX, July 2019.
18. Hanif R. Soysal, Joyoni Dey, and William P. Donahue, "Investigation of Scintillation Light Spread in a Hemi-ellipsoid Monolithic Crystal for Cardiac SPECT Using Geant4". The conference is SPIE Medical Imaging 2019, Feb 16-21 2019, San Diego, CA.
19. Abhejit Rajagopal; Noah Stier; Joyoni Dey; Michael A. King; Shivkumar Chandrasekaran. "Towards deep iterative-reconstruction algorithms for computed tomography (CT) applications". 2019 SPIE Medical Imaging conference, Feb. 16-21 2019, San Diego, CA.
20. Lydia J Wilson and Wayne D Newhauser. "Method to objectively justify and optimize planned exposures." 65th Annual Meeting of the Radiation Research Society, November 3-6, 2019.
21. Lydia J Wilson, Wayne D Newhauser, Christopher W Schneider, Florian Kamp, Michael Reiner, Juliana Martins, Guillaume Landry, Ralf-Peter Kapsch, Katia Parodi. "First treatment planning system for routine, personalized whole-body dose assessment for mega-voltage photon therapy." 61st Annual Meeting and Exhibition of the American Association of Physicists in Medicine (AAPM), July 14-18, 2019.
22. Lydia J Wilson and Wayne D Newhauser. "Generalized approach to radiotherapy treatment planning by directly optimizing the health outcome instead of dose: preliminary results for external-beam prostate radiotherapy." 61st Annual Meeting and Exhibition of the American Association of Physicists in Medicine (AAPM), July 14-18, 2019.
23. Tillary, Taddei, Moore, Ghallager. Feasibility of Out-of-field Dosimetry in Photon, Proton, and Neutron Therapies using a 3D-printed Patient-Specific Phantom. 61st Annual Meeting and Exhibition of the American Association of Physicists in Medicine (AAPM), July 14-18, 2019.

8. Donate Today!

KENNETH R. HOGSTROM SUPERIOR GRADUATE STUDENT SCHOLARSHIP FUND

As a highly acclaimed educator and researcher, Dr. Hogstrom 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.

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.

KENNETH R. HOGSTROM

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