Volume 10
2016

Medical Physics Alumni Newsletter

UTHealth
The University of Texas
Health Science Center at Houston

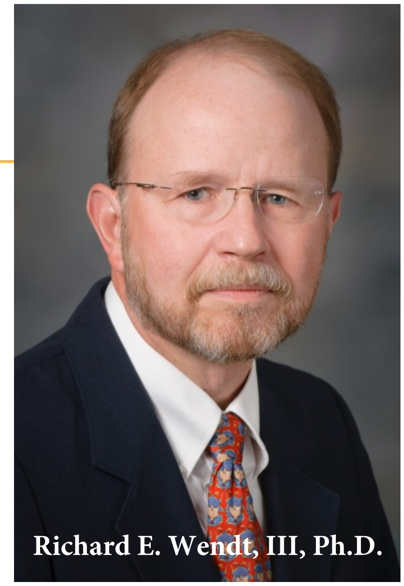
THE UNIVERSITY OF TEXAS
MD Anderson ~~Cancer~~ Center

Graduate School of Biomedical Sciences

“Your success is the ultimate validation of the program, for we aim to educate medical physicists of the highest caliber.”

Richard E. Wendt, III, Ph.D.
Director, Medical Physics Graduate Program

Director’s Report



Richard E. Wendt, III, Ph.D.

This past year has been a good one for the Graduate Program in Medical Physics. Two students who earned the Specialized Master of Science degree and eight who earned the Doctor of Philosophy degree were recognized at the commencement exercises this past May. Every one of them has gone on to clinical training, a post-doctoral fellowship or a faculty position.

We are all quite proud of our students and alumni. Please see the articles about our students’ AAPM presentations and the Blanchard Award winners for a look at the breadth and depth of their scholarly accomplishments. The report from the Student Council demonstrates that we have a body of students who enjoy themselves outside of the classroom and the laboratory as well as within them.

The program has a new Web site at http://gsbs.uth.edu/medphys/. Please pass it along to potential applicants to our program. The Frequently Asked Questions page includes a lot of information about admissions and our student body.

The program will welcome three new SMS students and six new Ph.D. students in late August. Their successful recruitment is the fruit of the hard work of Dr. Rebecca Howell, Director of Admissions, and her admissions committee. We made offers to 19% of the SMS applicants and 12% of the Ph.D. applicants. All of our SMS offers were accepted and 75% of our Ph.D. offers were accepted. Although our incoming SMS students are as impressive as ever, we are starting to see a decline in the number of outstanding applicants, perhaps because of the growing perception that it is more difficult to obtain a residency without a doctoral degree. The Department of Imaging Physics has adopted a policy that forbids its faculty members to advise SMS students, so the research options of future SMS students are limited primarily to the Department of Radiation Physics. However, we do have several students, both SMS and Ph.D. candidates, who are conducting their research in the Department of Cancer Systems Imaging or others areas of the institution.

The biggest change in the program has been a review and ongoing revision of the curriculum that is being led by Dr. Kyle Jones. Our students initiated this process and Kyle’s faculty committee has worked with them to develop a revised curriculum that balances the demands of CAMPEP accreditation with the desire of the students for more rigor and the desire of the faculty for a more efficient, research-friendly curriculum. The result is scheduled to take effect in the Fall of 2017, just in time for our CAMPEP re-accreditation review. By the way, a new requirement of CAMPEP is that programs seek feedback from their alumni regarding individual courses and the entire program. We will be asking our alumni for your thoughts and advice over the next year.

The development of the Doctor of Medical Physics program is proceeding. We asked alumni and friends to help with a needs assessment survey, and we received many helpful responses. The results of the assessment are summarized elsewhere in this newsletter. The biggest challenge is financial. The DMP program is expected by both the State of Texas and our institutional leaders to be self-sustaining. We are presently trying to construct a financial model that would satisfy this requirement while keeping the program affordable for its students.

Funding of our students early in their studies is an ongoing challenge. We are admitting fewer Ph.D. students this coming fall because the Graduate School has had to reduce the number of entering Ph.D. students whom it can support during their first two years while they take classes and find a research advisor to take over their support after their second year. The Shalek Fellowship funds that are earmarked for SMS students will be essentially depleted after this coming class enters. There are two Shalek accounts; one is specifically for SMS student support while the other may be used for all graduate students. We have intentionally consumed the dedicated SMS fund in anticipation of a shrinking SMS program. The more general fund is used both for the support of SMS students in their first year and for short-term funding of Ph.D. students on the rare occasions when the students' advisors fall short. The simple fact is that, even with the generous outpouring of memorials to Dr. Shalek over the past two years and the consistent donations from many loyal, regular supporters, current contributions alone have not met the needs of our students. The Shalek funds are running low as the accumulated balances have been drawn upon. The bright light in the funding situation is that our faculty members have of late had the means to support all of our students once they are at the stage of needing an advisor's support.

We are saddened to report is that our Program Manager for the past three years, Betsy Kindred, has left us for an exciting opportunity elsewhere within the UT System. We are pleased for Betsy and are grateful for her dedicated service to our faculty and students. Her absence over the past few weeks has underscored how crucial the role of Program Manager is to the smooth and efficient operation of our program and to our students' well-being. We hope to find a new Program Manager soon who has both the bureaucratic navigational skills and the personal warmth and caring with which Betsy supported the program so ably.

Finally, my personal thanks to our alumni. From Shalek Fellowship donations, to filling out surveys, to mentoring prospective students and referring them to the program, to personal advice, you have enriched the education of our students. Your success is the ultimate validation of the program, for we aim to educate medical physicists of the highest caliber.

Bud Wendt

Academic Year 2016 – 2017 Admission Data		
Applicant Data	**Ph.D.**	**SMS**
Total Applicants	68	16
Offers	8	3
Matriculating	6	3
Average Scores of Matriculating Students	**Ph.D.**	**SMS**
Undergraduate GPA	3.67	3.64
Graduate GPA	3.58	3.80
Verbal GRE	155	156
Quantitative GRE	163	161
Verbal + Quantitative GRE	319	317
Analytical GRE	4.25	4.30

Ph.D. Incoming Class

Daniela Branco
B.S., Wright State University
M.S., UT GSBS at Houston

Evan Johnson
B.S., Western Washington University
M.S., Western Washington University

Brigid McDonald
B.S., University of Virginia

Tucker Netherton
B.S., University of Tennessee-Knoxville
DMP, Vanderbilt University

Jeremiah Sanders
B.S., University of Texas at Arlington
M.S., Duke University

Emily Thompson
B.S., Texas A&M University

SMS Incoming Class

Garrett Baltz
B.S., University of California, Berkeley

Yuting Li
B.S., Changchun University of Science & Technology
Ph.D., Ohio University

Mary Peters
B.S., Georgia Institute of Technology

8th Annual Student Research Retreat

The student body continued its tradition of organizing a student retreat at which they discussed their research under the guidance of a distinguished medical physicist from another institution. The program faculty members do not participate in this event by design; it is by students and for students.

May 5, 2016

Keynote speaker, Jeff Siewerdsen, Ph.D., professor of Biomedical Engineering at Johns Hopkins University, touched down in Houston from Baltimore, MD. This was quite a coup for the students as Dr. Siewerdsen has made a significant impact with improving image reconstruction techniques and continues to be a leading researcher in the imaging field as a whole.

Dr. Siewerdsen's research is primarily focused on developing improved reconstruction models for cone-beam CTs. He is the principle investigator of the I-STAR (Imaging for Surgery, Therapy, and Radiology) laboratory at Johns Hopkins, a collaborative research group involving many different imaging system fields. He was elected to the AAPM Board of Directors in 2013 and currently sits on the AAPM Science Council.

The students were particularly excited to hear his feedback on the future direction of research in his field and the medical physics field as a whole.

May 6, 2016

Two morning workshops started the day's activities; the first on giving "elevator speeches" and the second on developing grant proposals with colleagues. Next, the afternoon student presentations were divided into three groups for the oral competition:

- First year students (tutorial and developing masters projects)
- Junior students (in years 2-3)
- Senior students (beyond 3 years)

The students and Dr. Siewerdsen scored each student presentation.

1st Place Oral Competition Winners

First Year Student Competition
Mark Newpower

Applying TOPAS for Proton Therapy Research

Junior Student Competition
Daniel Craft

Use & Validation of Flexible 3D Printed Tissue Compensators for Post-Mastectomy Radiation Therapy

Senior Student Competition
Xenia Fave

Delta-Radiomics: Using Therapy-Induced Tumor Changes to Predict NSCLC Patient Prognosis

Other Student Presenters

Brian Anderson: *Autocontouring of Cervical Cancer Nodes in Non-contrast CT*

Carlos Cardenas – *The Presentation Formerly Known as AI in RT*

Rachel Ger – *Longitudinal Salivary Glands DCE-MRI Changes*

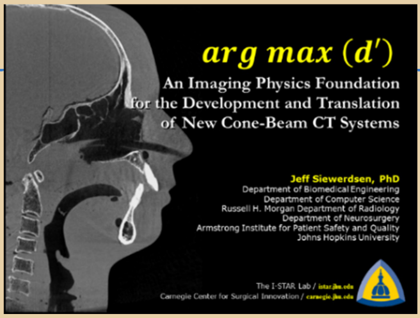
Sara Loupot - *Sparse Reconstruction for SPMR*

Chris Peeler – *Voxel-level Analysis of Image Change Response in Pediatric Patients Treated for Ependymoma with Passive Scattering Proton Therapy*

Megan Jacobsen – *Intra- and Inter-Scanner Variation in Dual-Energy CT*

James Kerns – *Identifying Treatment Planning System Errors through IROC-H Head & Neck Irradiations*

Lawrence Bronk - *Examining Proton RBE using Advanced in vitro Models*



At the end of the student presentations, the daytime activities concluded with the day's highlight, Dr. Siewerdsen's keynote presentation.

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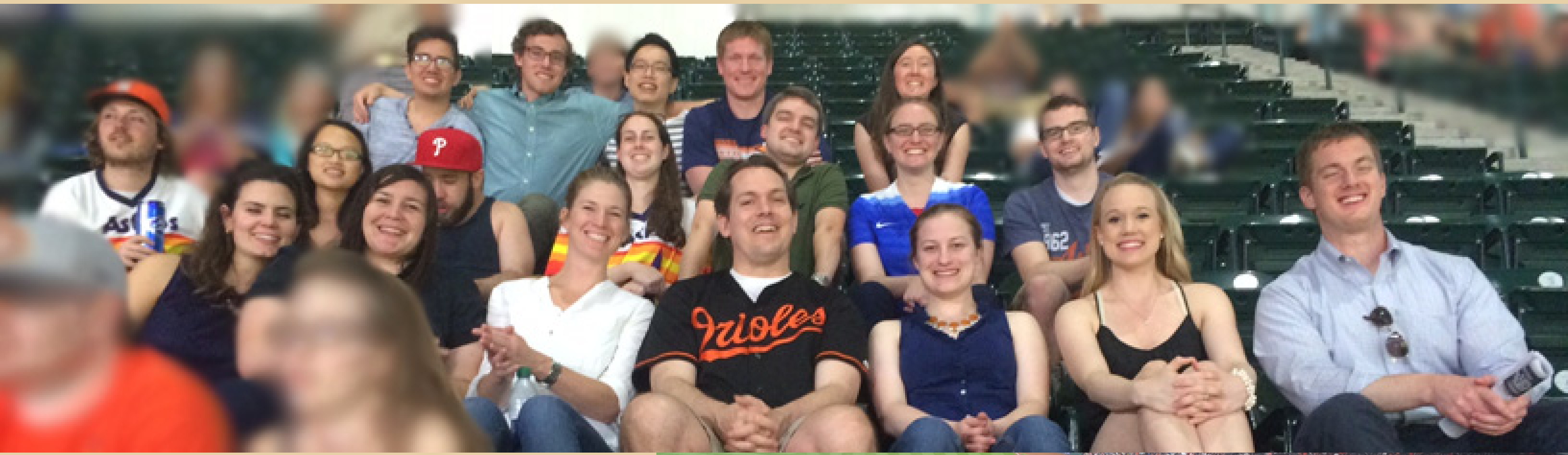
An Imaging Physics Foundation for the Development and Translation of New Cone-Beam CT Systems



At the conclusion of the keynote presentation, the students and Dr. Siewerdsen geared up for a fun night of Astros baseball at Minute Maid Park.

2015 – 2016
Student Update

The medical physics student body had an exciting year with team sports, awards, and two student retreats. Some of our senior students have graduated and taken new positions across the country and some just down the hallways. At the same time, a new class has joined us with a surprisingly strong spark of passion to succeed and develop friendships.

Xenia Fave
Football Team Captain

Rachel Ger
Football Team Captain

Every year the student body puts together a team to play intermural sports. This year, we had two football teams led by Xenia Fave and Rachel Ger. Our teams competed against rival GSBS programs, and while they did not go on to win first and second places, they had a more winning season than previous years.

Academically, our students have won more awards and recognitions than I can give any justice to here, so instead I would like to mention an award issued by the students: the Outstanding Teaching Award recipient, Jingfei Ma, Ph.D., won in a competitive election. The purpose of this award is to recognize a faculty member who has most gone above and beyond in their academic duties and has left a lasting positive impact on the student body. In the classroom, Dr. Ma's energy and passion amplified the student's enthusiasm, and in one-on-one meetings, he took the time to ensure that he explained complex material for anyone who was struggling.

The student research retreat, a tradition for the program over the past few years, was held in early Fall 2015 and in 2016 was moved up to late Spring. Traditionally, this retreat is an opportunity for students to present either their research projects or related subjects to a group of their peers as a way of promoting discussion while free of any pressures they may have in front of faculty members. Additionally, an honorary guest is invited from outside of the institution to offer a unique perspective for the presentations as well as to present a topic of his or her own. In 2015, Erin Angel, Ph.D., the senior manager of clinical collaborations of Toshiba America Medical Systems was invited to speak about medical physics industrial professions and how they would differ from more traditional academic or clinical options. This was contrasted by our guest speaker in 2016, Jeff Siewerdsen, Ph.D., a professor of biomedical engineering at Johns Hopkins University who discussed his research on improving image reconstruction techniques as well as discussing the direction and necessity of research as a whole and its future in the medical physics field.

Carlos Cardenas
Incoming Student-Faculty Liaison

Josh Gray
Incoming Education Chair

Finally, I would like to introduce the incoming student body representatives. Carlos Cardenas is stepping into the role of Student-Faculty Liaison. Josh Gray will be taking Carlos' previous role as Education Chair, and Daniela Branco will become the Social Representative. Each of these students have shown they care and have respect for the program, and I feel confident the student body will only improve through their tenure in office.

Mitchell Carroll
Outgoing Student-Faculty Liaison

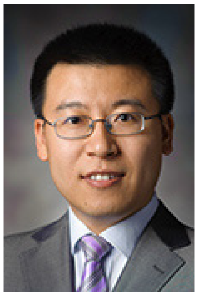
With that said, it has been an honor to serve as the Student-Faculty Liaison for this past year. I'm grateful for everything that this program is and for what it has offered to myself and the other students. I would like to thank all of the students who have helped with events this past year and especially to thank Betsy, Frances, and Dr. Wendt for all of their support.

Sincerely, Mitchell Carroll

Daniela Branco
Incoming Social Representative

Recognition and Achievements

In addition to the awards listed below, throughout this newsletter other special honors and recognitions are noted or highlighted.



Fada Guan, Ph.D.
Medical Physics Certificate Program
Assistant Professor, Radiation Physics
MD Anderson Cancer Center

Recipient of the 2016 AAPM Research Seed Funding Grant for his proposal entitled *Characterizing the biologic response of therapeutic protons at the cellular and DNA level in terms of their physical interactions.*

Current & Incoming Medical Physics Students

Maureen Aliru
Nanoparticles for Medicine Award 2016 Radiation Research Society Scholars-in-Training Travel Award

Garrett Baltz
Denton A. Cooley, M.D., Hope and Transformation Award

Shane Krafft
Rosalie B. Hite Fellowship (renewal)

Christopher Peeler
Committee Member: AAPM Science Council Associates Mentorship Program Associate 2015-2016

Christopher Walker
Julia Jones Matthews Cancer Research Scholar (renewal)

Joseph Weygand
Helmuth and Mary Fuchs and James R. Waterston Scholarship

Medical Physics Alumni

Asher Ai, Ph.D.
Received invitation of oral presentation to be featured in the Data Analysis & Instrumentation Basic Science Plenary Session at the SNMMI meeting

Tony Blatnica, M.S.
Passed ABR boards in Diagnostic Medical Physics

Rebecca Marsh, Ph.D.
Elected Rocky Mountain Chapter Representative to the AAPM Board of Directors

Russell Tarver, M.S.
Elected a fellow of the AAPM in 2015

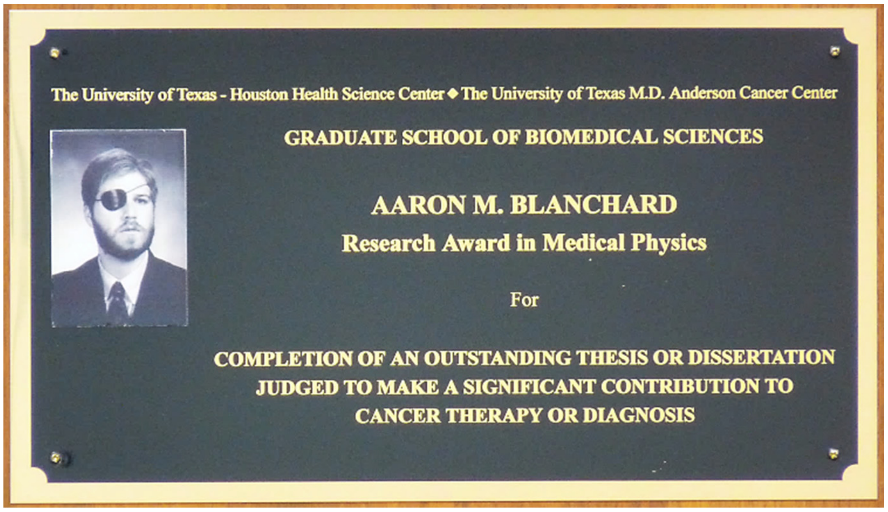
Brian Taylor, Ph.D.
Passed ABR boards in Diagnostic Medical Physics

Imaging Physics Residents

Steven Bache, M.S.
Selected by the AAPM as a Farrington Daniels Award recipient for best paper in radiation dosimetry published in 2015. The paper, *Investigating the accuracy of microstereotactic-body-radiotherapy utilizing anatomically accurate 3D printed rodent-morphic dosimeters* was part of his Master's thesis work at Duke.

The Aaron Blanchard Research Award

The Aaron Blanchard Research Award was established as a memorial to Aaron Blanchard, a graduate student in the Medical Physics Program, who succumbed to cancer before earning his degree.



The award was created by Aaron's family and is sustained by their generosity and by other donations to the GSBS. It recognizes a Medical Physics graduate (M.S or Ph.D.) for completion of an outstanding thesis or dissertation, which is judged to make a significant contribution to cancer therapy or diagnosis. The recipient of the award is selected by a sub-committee reporting to the Medical Physics Graduate Program's Steering Committee. The award consists of a certificate and cash. Additionally, the graduate's name is engraved on the Aaron Blanchard Research Award in Medical Physics plaque that is on display in the classroom, and a book plate is placed on the front page of the graduate's thesis in recognition of the award.

2016 Recipient

Daniel Robertson, Ph.D.

Volumetric scintillation dosimetry for scanned proton beams

Dr. Robertson is currently a Medical Physics Resident at MD Anderson. His research in the Beddar Laboratory focuses on developing 3D radiation detectors using liquid scintillators. This work includes detector design, methods to correct for optical artifacts and non-linear scintillator response, and applications in proton therapy quality assurance testing.

Previous Recipients

2015 John Eley, Ph.D.
2015 Luke Hunter, M.S.
2013 Kevin Casey, M.S.
2012 Richard Castillo, Ph.D.
2011 Brian Taylor, Ph.D.
2010 Malcolm Heard, Ph.D.
2009 Jonas Fontenot, Ph.D.
2008 Stephen Kry, Ph.D.
2007 Jennifer O'Daniel, Ph.D.
2006 Jason Shoales, M.S.
2005 Kent Gifford, Ph.D.
2004 Stephen Kry, M.S.
2003 Jennifer O'Daniel, M.S.
2002 R. Jason Stafford, Ph.D.
2001 Brent Parker, M.S.
2000 Steven McCullough, Ph.D.
1999 Teresa Fischer, M.S.

Robert J. Shalek Fellowship Fund

The Robert J. Shalek Fellowship Fund is used specifically for the support of the medical physics educational programs, and is used in conjunction with other funds to support current fellowships. Donations to this fund also support the long-term goal of providing continuous funding for the fellowships.

2016
Garrett Baltz
Yuting Li
Mary Peters

2015
- Brian Anderson
- Laura Bennett
- Benjamin Musall

2014
- Daniela Branco
- Harlee Harrison
- Joseph Weygand

2013
- Mattie McInnis
- Olivia Popnoe

2012
- Ming Jung Hsieh
- Jennifer Sierra Irwin
- Dana Lewis
- Justin Mikell

2011
- Shuaiping Ge
- Annelise Giebeler
- Olivia Huang
- Elizabeth McKenzie
- James Neihart
- Matthew Wait

2010
- Jennelle Bergene
- Kevin Casey
- Jared Ohrt
- Kevin Vredevoogd

2009
- Sarah Joy
- Emily Neubauer
- Paige Summers
- Jackie Tonigan Faught

2008
- Joseph Dick
- James Kerns

2007
- Triston Dougall
- Georgi Georgiev
- Ryan Grant Lafratta
- Malcolm Heard
- Katie West

2006
- Maria Bellon
- Jimmy Jones
- Nathan Pung
- Yevgeney Vinogradskiy

2005
- Renee Dickinson
- Susannah Lazar
- Alanna McDermott
- Paige Nitsch

2004
- Michael Bligh
- Ryan Hecox
- Hilary Voss

2003
- Blake Cannon
- Scott Davidson

2002
- Earl Gates
- Kenneth Homann
- Hilary Voss
- Claire Nerbun

2001
- Melinda Chi
- Gary Fisher
- Kelly Kisling
- Jackeline Santiago
- David Zamora

2000
- Michael Beach

1999
- Laura Butler
- Amanda Davis
- Nicholas Koch
- Jennifer O'Daniel
- Nicholas Zacharopoulos

1998
- Shannon Bragg-Sitton
- Christopher Cherry
- Dee-Ann Radford

1997
- Christopher Baird
- Aaron Blanchard
- Michael Lemacks
- Luke McLemore

1996
- Michael Bieda
- Tamara Duckworth
- Gwendolyn Myron

1995
- Jonathan Dugan
- Teresa Fischer
- Russell Tarver

1994
- Victor Howard
- Usman Qazi
- Donna Reeve
- Steve Thompson
- Matthew Vossler

1993
- Kyle Antes
- Sarah Danielson
- Dena McCowan
- Donna Reeve
- Matthew Vossler

1992
- Peter Balter
- Kay Jones

1991
- John Bayouth
- Robert Praeder
- Twyla Willoughby

1990
- Maria Graves
- John Wallace

1989
- Mike Gazda
- Scott Jones

From 1987 to 2015, 96 Shalek Fellowships have been awarded. In recent years, an average of two Ph.D. students a year have received short-term bridge funding.

The selection of Shalek Fellows is the responsibility of the Medical Physics Program Steering Committee.

Samuel John Fahrenholtz, Ph.D.

Graduated: December 2015

Prediction of Laser Ablation in Brain: Sensitivity, Calibration, and Validation

Advisory Committee

Jason Stafford, Ph.D.
(Advisor & Committee Chair)

James Bankson, Ph.D.

David Fuentes, Ph.D.

John Hazle, Ph.D.

Arvind Rao, Ph.D.

Dissertation Abstract Reprinted with Permission

The surgical planning of MR-guided laser induced thermal therapy (MRgLITT) stands to benefit from predictive computational modeling. The dearth of physical model parameter data leads to modeling uncertainty. This work implements a well-accepted framework with three key steps for model-building: model-parameter sensitivity analysis, model calibration, and model validation.

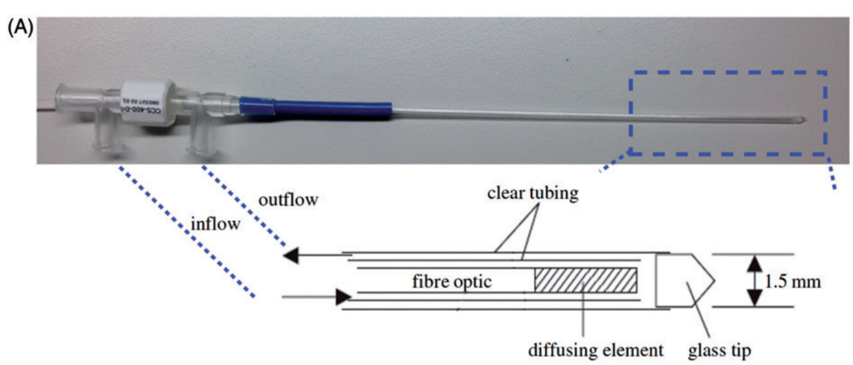
The sensitivity study is via generalized polynomial chaos (gPC) paired with a transient finite element (FEM) model. Uniform probability distribution functions (PDFs) capture the plausible range of values suggested by the literature for five model parameters. The five PDFs are input separately into the FEM model to gain a probabilistic sensitivity response of the model to the input PDFs. The result demonstrates the model output variance is dominated by the three optical parameters and the two remaining parameters contribute less.

The second aim is model calibration, given the need to acquire model parameter data of greater precision sans physical measurement. The availability of a relatively large cohort of $N = 22$ clinical laser ablations of metastases gradient-based inverse problems provides inference of the optical parameter values, the most sensitive parameter as indicated by gPC, from patient MR temperature imaging (MRTI). In order to accelerate the bioheat model for iteration during parameter optimization, two simplified models are conceived: (1) a homogeneous, transient FEM model implemented on GPU and (2) a homogeneous, steady-state, analytic model implemented on GPU. After model optimization — i.e., calibration — the model validation immediately follows via leave-one-out cross-validation (LOOCV). LOOCV compares the two trained models' predictive performances. During LOOCV, the FEM model correctly predicts 15 of 22; the steady state model correctly predicts 17 of 22. A steady state model using naïve literature values correctly predicts only 10 of 22. When training on an $N = 20$ cohort tailored to only include ablations near steady state, the trained steady state model correctly predicts 19 of 20 patient datasets versus the 8 of 20 predicted by an untrained steady state model.

The conclusion is model training is an effective means of improving model performance when there is lack of accurate and precise parameter data in the literature, especially when there is little prospect of improving data quality. A key to success in this model-training paradigm is to have a training/calibration cohort that has adequate similarity to the predicted/validation cohort.

Dr. Fahrenholtz is currently following they Hybrid Pathway option in the Imaging Physics Residency Program. During his three-year appointment as an MD Anderson Fellow in Medical Physics, Dr. Fahrenholtz will receive two-years of full-time equivalent clinical training while performing one full-time equivalent year of research.

Dr. Fahrenholtz's research mentor is currently David Fuentes, Ph.D., an expert in computational science who worked closely with him through his graduate studies and served as a co-advisor on his project.



The Visualase applicator modelled in this application and a diagram of the photon emitting diffusing tip and the cooling fluid are shown.

David Vincent Fried, Ph.D.

Graduated: December 2015

Investigation of Quantitative Image Features from Pretreatment CT and FDG-PET Scans in Stage III NSCLC Patients Undergoing Definitive Radiation Therapy

Advisory Committee

Laurence Court, Ph.D.
(Advisor & Committee Chair)

Zhongxing Liao, M.D.

Geoffrey Ibbott, Ph.D.

Osama Mawlawi, Ph.D.

Shouhao Zhou, Ph.D.

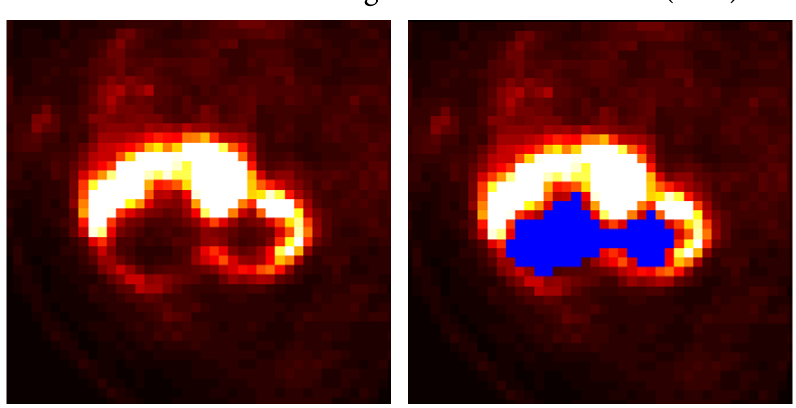
Dr. Fried is currently working as a clinical assistant professor in the Department of Radiology at the University of North Carolina at Chapel Hill.

Dissertation Abstract Reprinted with Permission

The purpose of this work was to determine if quantitative image features (QIFs) extracted from computed tomography (CT) and flourodeoxyglucose (FDG) positron emission tomography (PET) could provide prognostic information to improve outcome models. Our goal for this work was to determine if it may one day be feasible to incorporate QIFs into personalized cancer care. QIFs were used to quantitatively characterize patient disease as seen on imaging. A leave-one-out cross-validation procedure was used to assess the prognostic ability of QIFs extracted from CT and PET in addition to conventional prognostic factors (CPFs). QIFs were found to improve model fit for overall survival in contrast enhanced CT (CE-CT) ($p=0.027$) and FDG-PET ($p=0.007$). Correlations/associations were observed between QIFs from CE-CT, FDG-PET, and CPFs. However, our results indicate that while correlations/associations exist, QIFs provided additional prognostic information. QIFs from FDG-PET improved models using CPFs including GTV in terms of patient stratification, c-index, and log-likelihood more than QIFs from CE-CT alone. Various studies were performed assessing the reproducibility of FDG-PET based QIFs and found that reconstruction methods certainly impact the obtained QIF values. However, features maintain a reasonable reproducibility (mean CCC = 0.78) that may be improved when using similar reconstructions (e.g., 3D OSEM) (CCC = 0.93). The two FDG-PET features found to be prognostic were also able to isolate sub-cohorts of patients that demonstrated survival differences based on radiation dose.

QIFs were found to provide additional prognostic information beyond that found from CPFs. Initial evidence suggests that the examined FDG-PET based QIFs may have utility across cohorts and could potentially determine which patients may benefit from dose escalation.

PET Results of auto-segmentation of necrosis (blue)



James R. Kerns, Ph.D.

Defended: June 2016

Identifying Treatment Planning Systems Errors in IROC-Houston Head & Neck Phantom Irradiations

Dissertation Abstract Reprinted with Permission

Treatment Planning System (TPS) errors can affect large numbers of cancer patients receiving radiation therapy. Using an independent recalculation system, the Imaging and Radiation Oncology Core-Houston (IROC-H) can identify institutions that have not sufficiently modelled their linear accelerators in their TPS model. Linear accelerator point measurement data from IROC-H's site visits was aggregated and analyzed from over 30 linear accelerator models. Dosimetrically similar models were combined to create "classes". The class data was used to construct customized beam models in an independent treatment dose verification system (TVS). Approximately 200 head and neck phantom plans from 2012 to 2015 were recalculated using this TVS. Comparison of plan accuracy was evaluated by comparing the measured dose to the institution's TPS dose as well as the TVS dose. In cases where the TVS was more accurate than the institution by an average of >2%, the institution was identified as having a non-negligible TPS error. Of the ~200 recalculated plans, the average improvement using the TVS was ~0.1%; i.e. the recalculation, on average, slightly outperformed the institution's TPS. Of all the recalculated phantoms, 20% were identified as having a non-negligible TPS error. Fourteen plans failed current IROC-H criteria; the average TVS improvement of the failing plans was ~3% and 57% were found to have non-negligible TPS errors.

Conclusion: IROC-H has developed an independent recalculation system to identify institutions that have considerable TPS errors. A large number of institutions were found to have non-negligible TPS errors. Even institutions that passed IROC-H criteria could be identified as having a TPS error. Resolution of such errors would improve dose delivery for a large number of IROC-H phantoms and ultimately, patients.

Advisory Committee

Stephen Kry, Ph.D.
(Advisor & Committee Chair)

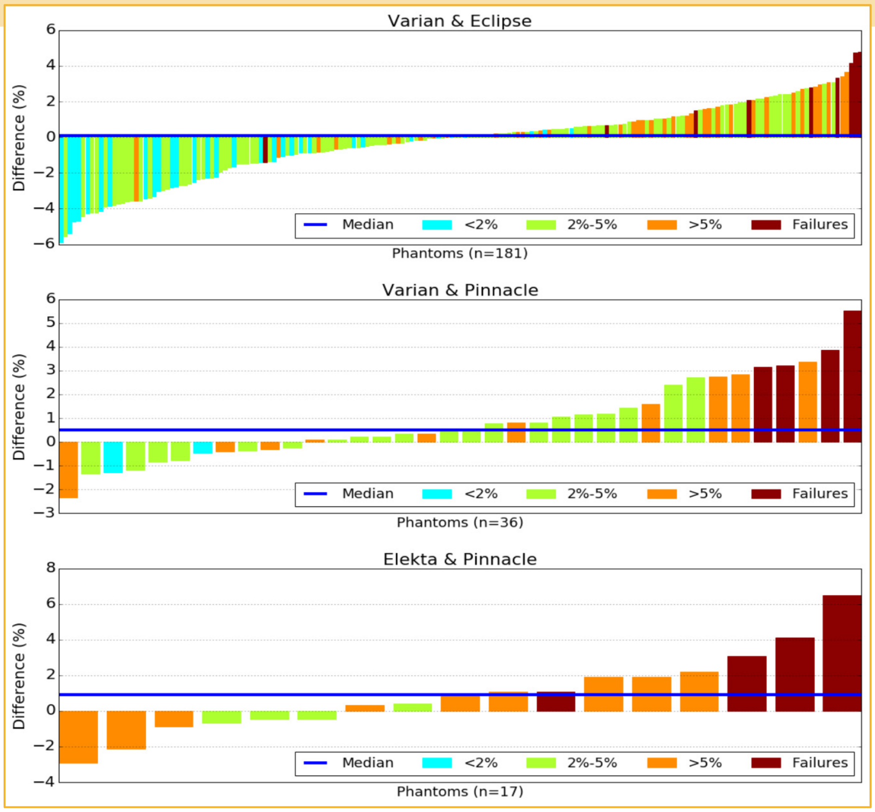
David Followill, Ph.D.

Rebecca Howell, Ph.D.

Adam Melancon, Ph.D.

Francesco Stingo, Ph.D.

Dr. Kerns is starting a Therapy Medical Physicist position at CAMC Cancer Center in Charleston, WV.



Phantom recalculation difference values plotted according to the linac/TPS configurations; each graph shows a linac/TPS configuration. Colors indicate tiers of original agreement between the TPS and TLD doses.

Ryan G. Lafratta, Ph.D.

Graduated: August 2015

Quality Assurance of Advanced Treatment Modalities using Presage® Dosimeters

Dissertation Abstract Reprinted with Permission

Computer-controlled therapy machines allow for increasingly complex plans, as there are more variables that can be tuned to produce the ideal result. This makes it increasingly difficult to assure the intended calculated dose is being delivered correctly using current techniques that are 2D-based because the resultant dose distributions can differ markedly in various sections of the target. A measurement of composite dose from the entire plan should be included in patient-specific IMRT QA. A volumetric dosimeter such as PRESAGE® is able to provide a complete 3D measured dosimetry dataset with one treatment plan delivery. It was hypothesized that a PRESAGE® dosimeter would agree with 2D measurements within ±5%/3mm using a gamma index analysis. The PRESAGE® dosimeter will detect dose discrepancies not detected with 2D measurements resulting in a 5% change in the normal tissue complication probability (NTCP). An optical CT scanner was tested for reproducibility and reliability and a standard operating procedure was created. The PRESAGE® dosimeters were extensively tested for dose stability over a range of time for remote dosimetry applications. The effect of temperature changes before, during and after irradiation was investigated. The dosimeter was found to be appropriate for remote dosimetry for relative dose measurements. The IROC-Houston Head and Neck (HN) phantom was imaged with an x-ray CT scanner. One scan used an insert for film and thermoluminescent dosimeter (TLD). A second scan was taken using a PRESAGE® insert. An IMRT treatment plan was created and delivered to the phantom using each insert. The gamma index analysis was performed at ±5%/3mm. The PRESAGE® measurements agreed well with the 2D measurements. Various gamma constraints were applied to the measured data to determine an appropriate passing criterion for 3D gamma analysis. The IMRT treatment plan was modified to induce several different types of treatment and delivery errors. The plans were analyzed using 2D and 3D gamma analysis. Two plans passed a 2D metric while failing the 3D metric with one of the plans also having a 5% change in NTCP. The hypothesis was proven correct and further work should be considered to bring PRESAGE® into a phantom dosimetry program.

Advisory Committee

Geoffrey S. Ibbott, Ph.D.
(Advisor & Committee Chair)

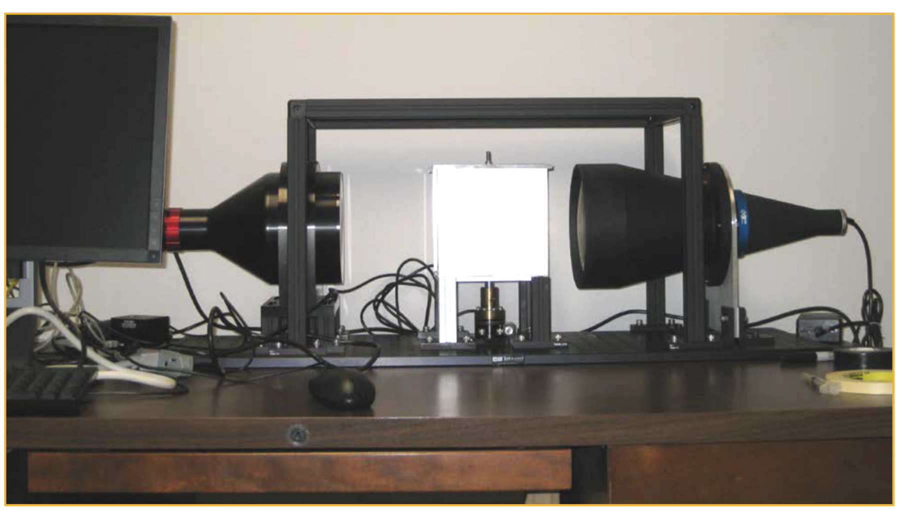
David Followill, Ph.D.

Narayan Sahoo, Ph.D.

James Yang, Ph.D.

Susan Tucker, Ph.D.

Dr. Lafratta is currently working as a Medical Physicist at CHI St. Luke's Health in Houston.

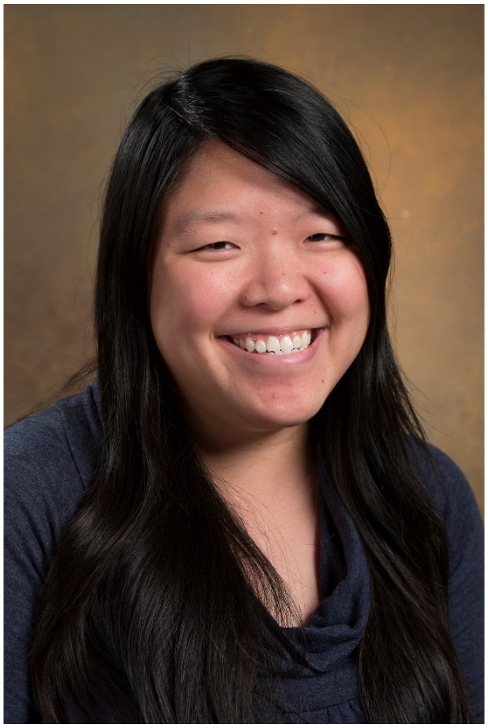


The DMOS-IROC with the CCD camera on the left and the light source shining from the right.

Tze Yee Lim, Ph.D.

Defended: June 2016

Encapsulated Contrast Agent Markers for MRI-based Post-implant Dosimetry



Advisory Committee

Rajat Kudchadker, Ph.D.
(Advisor & Committee Chair)

Geoffrey Ibbott, Ph.D.

Steven Frank, Ph.D.

R. Jason Stafford, Ph.D.

Arvind Rao, Ph.D.

Dr. Lim will be starting the therapy clinical residency at the University of California San Diego's Department of Radiation Medicine and Applied Sciences.

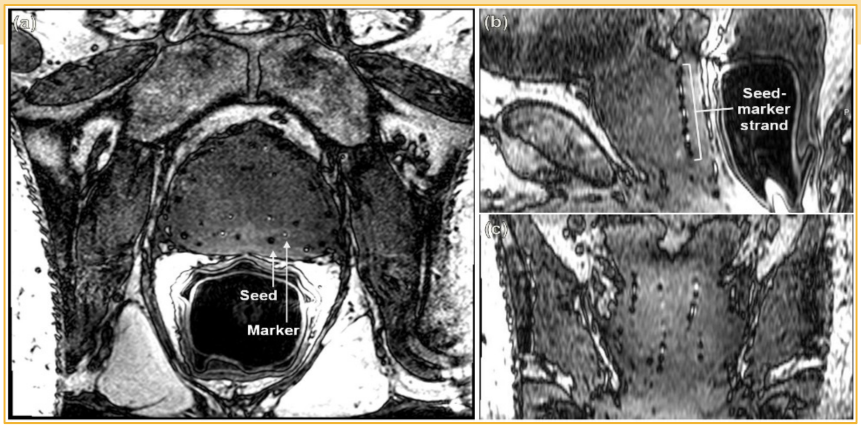
Dissertation Abstract Reprinted with Permission

Low-dose-rate prostate brachytherapy involves the implantation of tiny radioactive seeds into the prostate to treat prostate cancer. The current standard post-implant imaging modality is computed tomography (CT). On CT images, the radioactive seeds can be distinctively localized but delineation of the prostate and surrounding soft tissue is poor. Magnetic resonance imaging (MRI) provides better prostate and soft tissue delineation, but seed localization is difficult. To aid with seed localization, MRI markers with encapsulated contrast agent that provide positive-contrast on MRI images (Sirius MRI markers; C4 Imaging, Houston, TX) have been proposed to be placed adjacent to the negative-contrast seeds. This dissertation describes the development of the Sirius MRI markers for prostate post-implant dosimetry.

First, I compared the dose-volume histogram and other dosimetry parameters generated by MIM Symphony (a brachytherapy treatment planning system that allow the use of MRI images for treatment planning; MIM Software Inc., Cleveland, OH) and VariSeed (a widely used brachytherapy treatment planning system; Varian Medical Systems, Inc., Palo Alto, CA), and found the dosimetry between both brachytherapy treatment planning systems to be comparable. To gain more insight into the MRI contrast characteristics of the Sirius MRI markers, I measured the Sirius MRI marker contrast agent's spin-lattice and spin-spin relaxivities, and studied the relaxation characteristics' dependence on MRI field strength, temperature, and orientation.

From the Sirius MRI marker's contrast agent relaxation characteristics, I systematically studied the effect of varying MRI scan parameters such as flip angle, number of excitations, bandwidth, field of view, slice thickness, and encoding steps, on the Sirius MRI markers' signal and contrast, as well as image noise, artifact and scan time. On patients implanted with Sirius MRI markers, I evaluated the visibility of the Sirius MRI markers and image artifacts. Lastly, I semi-automated the localization of markers and seeds to more enable the efficient incorporation of Sirius MRI markers as part of the clinical post-implant workflow.

Ultimately, the Sirius MRI markers may change the paradigm from CT-based to MRI-based post-implant dosimetry, for a more accurate understanding of dose-response relationships in patients undergoing low dose rate prostate brachytherapy.



(a) Axial, (b) sagittal, and (c) coronal MR images of the Sirius MRI markers that are interleaved between radioactive seeds to assist seed localization for MRI-based post-implant dosimetric assessment.

Justin Mikell, Ph.D.

Graduated: December 2015

Voxel-Level Absorbed Dose Calculations with a Deterministic Grid-Based Boltzmann Solver for Nuclear Medicine and the Clinical Value of Voxel-Level Calculations

Advisory Committee

S. Cheenu Kappadath, Ph.D.
(Advisor & Committee Chair)

Veera Baladandayuthapani, Ph.D.

William Erwin M.S.

Armeen Mahvash, M.D.

Firas Mourtada, Ph.D.

Uwe Titt, Ph.D.

Todd Wareing Ph.D.

Dr. Mikell is currently an Academic Clinical Physics Resident in the Radiation Oncology department at the University of Michigan in Ann Arbor.

Dissertation Abstract Reprinted with Permission

Voxel-level absorbed dose (VLAD) is rarely calculated for nuclear medicine (NM) procedures involving unsealed sources or 90Y microspheres (YM). The current standard of practice for absorbed dose calculations in NM utilizes MIRD S-values, which 1) assume a uniform distribution in organs, 2) do not use patient specific geometry, and 3) lack a tumor model. VLADs overcome these limitations. One reason VLADs are not routinely performed is the difficulty in obtaining accurate absorbed doses in a clinically acceptable time. The deterministic grid-based Boltzmann solver (GBBS) was recently applied to radiation oncology where it was reported as fast and accurate for both megavoltage photons and high dose rate nuclide-based photon brachytherapy.

This dissertation had two goals. The first was to demonstrate that the general GBBS code ATTILA™ can be used for VLADs in NM, where primary photon and electron sources are distributed throughout a patient. The GBBS was evaluated in voxel-S-value geometries where agreement with Monte Carlo (MC) in the source voxel was 6% for 90Y and 131I; 20% differences were seen for mono-energetic 10 keV photons in bone. An adaptive tetrahedral mesh (ATM) generation procedure was developed using information from both the SPECT and CT for 90Y and 131I patients. The ATM with increased energy transport cutoffs, enabled GBBS transport to execute in under 2 (90Y) and 10 minutes (131I). GBBS absorbed doses to tumors and organs were within 4.5% of MC. Dose volume histograms were indistinguishable from MC.

The second goal was to demonstrate VLAD value using 21 YM patients. Package insert dosimetry was not able to predict mean VLAD tumor absorbed doses. Partition model had large bias (factor of 0.39) and uncertainty (±128 Gy). Dose-response curves for hepatocellular carcinoma tumors were generated using logistic regression. The dose covering 70% of volume (D70) predicted binary modified RECIST response with an area under the curve of 80.3%. A D70 88 Gy threshold yielded 89% specificity and 69% sensitivity.

The GBBS was shown to be fast and accurate, flaws in clinical dosimetry models were highlighted, and dose-response curves were generated. The findings in this dissertation support the adoption of VLADs in NM.

The three meshes of the octant are shown with increasing number of tetrahedrons in and around the source voxel, which is identified by the arrow.

$\boldsymbol{M0}$ with ≈ 8,000 tetrahedrons $\boldsymbol{M1}$ with ≈16,000 tetrahedrons $\boldsymbol{M2}$ with ≈ 64,000 tetrahedrons

Outstanding
Teaching Award

Every year the Medical Physics Graduate Program students honor an outstanding faculty member who they believe has gone above and beyond in his or her role as an academic professor. This year, Jingfei Ma, Ph.D., was nominated and voted to receive this Outstanding Teaching Award by the student body.

The Medical Physics Graduate Program students thank Dr. Ma for his efforts in promoting exceptional learning and for his setting an academic example to the students and other faculty members alike.

Recognizing a faculty member whose commitment to education has served to positively impact the students' experiences in the Medical Physics Graduate Program.

2016 Outstanding Teaching Award Recipient
Jingfei Ma, Ph.D.
Professor, Department of Imaging Physics, MD Anderson
Regular Faculty, Medical Physics Program, UT-Health, GSBS

2015 Provost's Distinguished Clinical Faculty Mentor Award

October 2015

"John has a unique ability to understand the background and politics of interdisciplinary research teams and is always pointing out areas where differing backgrounds can complement each other to advance the science."

"He is also very passionate about ensuring that research directions align with pursuits able to meet a demonstrated clinical need."

"He does not micromanage, choosing to delineate expectations and follow up with regular meetings to enforce a sense of personal responsibility and ownership."

"In a hypercompetitive culture, where funding and resources are scarce, John selflessly supports and advocates for those around him."

"Dr. Hazle's guidance opened my eyes to the tremendous potential impact that technical scientists could have on the front lines of cancer research."

"In addition to helping me [establish] my translational research program, John has been also helping me [navigate] various aspects of faculty life from administrative service to finding the right balance between professional and personal life."

"He has a distinctly approachable and enjoyable personality and it is easy to discuss new ideas with him without any apprehension."

Ethan Dmitrovsky, M.D.
Provost & Executive Vice President
MD Anderson

John Hazle, Ph.D.
Award Recipient
Medical Physics Alumnus
& Current Program Mentor

Alumni Spotlight

Brian Taylor, Ph.D.

What 3 words best describe your experience in the Medical Physics Graduate Program?

Insightful. Worthwhile. Challenging.

What led you to decide to enroll in the Medical Physics Graduate Program?

After an AAPM undergraduate fellowship and a St. Jude Children's Research Hospital summer fellowship, I became interested in medical imaging research. I was told by people at St. Jude that MD Anderson was a great place to receive training in Medical Physics.

What was your dissertation title and topic?

"Dynamic Chemical Shift Imaging for Image-Guided Thermal Therapy". This involved developing a rapid MR technique to guide thermal therapies.

What was the most significant, memorable, surprising event(s) during the program?

Most memorable: The many hours spent doing experiments with colleagues at the basement MR scanner.

Who was your mentor and how did s/he help you to achieve your educational and career goals?

I was Dr. Jason Stafford's first Ph.D. student. He devoted a lot of time and energy in helping me on lab projects and papers. I'm very thankful to have him as my Ph.D. advisor.

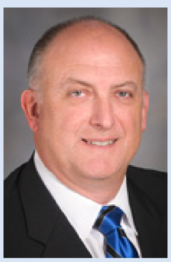
What opportunities or job offers did you have upon graduation?

I accepted a postdoctoral research fellowship position at St. Jude Children's Research Hospital in Memphis, TN.

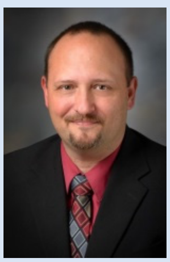
What position do you now hold?

I am currently an Assistant Professor of Radiology and Physical Medicine & Rehabilitation at Baylor College of Medicine. At BCM, I work with a multi-disciplinary team working in traumatic brain injury research. I am also an Imaging Physicist at the Michael E. DeBakey VA Medical Center in Houston.

John Hazle, Ph.D.
Professor & Chair



Jason Stafford, Ph.D.
Professor



Joshua Yung, Ph.D.
Instructor

For Me, the Medical Physics Graduate Program Was …

stimulating
gratifying
successful

excellence
challenging
rewarding

enriching
thought-provoking
stretching

Alumni Spotlight

Donna Reeve, M.S.

What 3 words best describe your experience in the Medical Physics Graduate Program?

Fascinating. Challenging. Rewarding.

What led you to decide to enroll in the Medical Physics Graduate Program?
I was working as a geophysicist for Chevron in California when I learned about the field of medical physics through a friend who was doing post-doctoral research in MRI at MD Anderson. The instant he described the field I knew that I wanted to pursue a career in medical imaging. I chose to enroll in the GSBS Medical Physics program because of its reputation and because it meant studying both therapy and imaging physics at MD Anderson Cancer Center.

What was your thesis title and topic?
"Pharmacokinetic Model Parameter Estimation for Brain Lesions Using Dynamic Keyhole Fast Spin-Echo MR Imaging". I constructed gel phantoms to model dynamic MR contrast enhancement and imaged the phantoms using keyhole techniques to accelerate image acquisition. The measured signals were fit to pharmacokinetic models to determine the impact of acceleration on parameter estimation.

What was the most significant, memorable, or surprising event(s) during the program?
Attending this program was significant because it meant going back to school to get a second M.S. degree to make a career change. I had always been interested in medicine and I feel very fortunate to have been able to make the switch to medical physics. I went from using physics to map geologic structures in my previous career to learning how physics is applied to imaging and treating the human body. It was all very fascinating to me.

Who was your mentor and how did s/he help you to achieve your educational and career goals?
My advisor was Ed Jackson. I chose a thesis topic in MRI because MRI was (and still is) so interesting to me. It's a very complex and versatile imaging modality. Ed is extremely knowledgeable about MRI. He's a great teacher and a patient mentor.

What opportunities or job offers did you have upon graduation and what position do you now hold?
My first job after graduate school was as a diagnostic medical physicist at Western Pennsylvania Hospital in Pittsburgh, Pennsylvania. I worked in a small medical physics group and was responsible for quality control testing of the diagnostic imaging equipment and for teaching in the Radiology Residency Program. I was also a member of the team who implemented and supported the PACS system. Because I was fresh out of graduate school and just beginning to learn how medical images were used in radiology, teaching the residents was challenging. But through teaching I learned a tremendous amount and it prepared me to take the ABR exam in Diagnostic Medical Physics.

After five years, I left Pennsylvania to work for a medical physics consulting group in California. This was great work experience because I supported so many different radiology departments.

I returned to MD Anderson in 2004 and currently work in the MRI and Ultrasound Section of the Department of Imaging Physics. I am responsible for the MRI and ultrasound quality control programs and I teach in the Imaging Physics Residency and GSBS Medical Physics graduate programs.

Ho-Ling Anthony Liu, Ph.D.

Medical Physics Resident Alumnus

What 3 words best describe your experience in the Imaging Physics Residency Program?

Fruitful. Memorable. Appreciation.

What led you to decide to enroll in the Imaging Physics Residency Program?
After I finished my Ph.D. in 2000, I returned to Taiwan and became a faculty member in Chang Gung University and a diagnostic physics consultant at Chang Gung Memorial Hospital, the largest hospital in Taiwan. At that time in Taiwan, there was no certification system for imaging physics and there was no standardized curriculum for medical physics graduate programs.

Because I had passed Part I of ABR exam when I was in San Antonio and also Part II (in 2002) after I returned to Taiwan, I thought to complete the ABR certification process which might help me to establish the diagnostic medical physics profession in Taiwan. At that time, I believed that enrolling in the Imaging Physics Residency Program of MD Anderson would be the best way for me to achieve these goals.

How did your training and research schedule work?
My university approved only one-year leave for me, and I was lucky enough to be allowed to complete the residency training in one year. The original start date was August 2003, but it was postponed to February 2004 due to the fact that I only had one year and MD Anderson were expanding significantly in that period of time and needed hands to help equipment acceptance testing. This was a great and unique opportunity for me.

Another factor that affected my training schedule was that I was approved to sit-in the ABR Part III exam in 06/2004. Considering all of this, Imaging Physics faculty were extremely kind to allow me to receive intensive training during the first five months of my residency, in order to help me pass the ABR exam (which I did). After that I worked on acceptance testing of new imaging equipment and research related to computed radiography (CR), supervised by Dr. Chuck Willis.

Who was your mentor and how did s/he help you to achieve your educational and career goals?
My mentors are Dr. Hazle, Dr. Willis and Donna Stevens. Dr. Hazle oversaw the goals and directions for my training. Donna had biweekly meeting with me to make sure I was on the right path. Dr. Willis offered opportunities for frequent (almost daily) discussion for me to learn the broad scope of imaging physics and also supervised my researches.

What was the most significant, memorable, or surprising event(s) during the program?

1. I took and passed the ABR oral exam in June 2004, and Dr. Willis hosted a party for me and Ish (another residency graduate) at Jax Grill.

2. Working in the under-constructed ACB and CPB buildings was a memorable experience.

3. Farewell party and gift presentation for me in January 2005 was a surprise.

What opportunities did you have upon completion and what position do you now hold?
Right before I joined the Residency Program, I was just promoted to Associate Professor in Taiwan. After I finish the program, I returned to that position in February 2005. My residency training at MD Anderson turned out to be the key for the following accomplishments:

- In 2006, we established a medical physics graduate program in Taiwan, following CAMPEP guidelines.

- In 2006 we helped Atomic Energy Council (AEC) of Taiwan to establish MQSA which became regulation in 2008.

- In 2007, Chinese Society of Medical Physics-Taipei started certifying Diagnostic Medical Physicist.

- In 2009 we helped AEC of Taiwan to establish CT Quality Assurance Standards which became regulation in 2011.

I returned to MD Anderson as a professor about two years ago. I am very happy and very much appreciate the opportunity for me to join the Imaging Physics family.

John Rong, Ph.D.

Medical Physics Resident Alumnus

What 3 words best describe your experience in the Imaging Physics Residency Program?

Opportunity. Resource. Support.

What led you to decide to enroll in the Imaging Physics Residency Program?
When I was doing postdoctoral research in Radiation Oncology at the University of Michigan, my projects were in medical imaging. At the time I was completing my postdoctoral fellowship, I decided to pursue a professional career in imaging physics instead of in therapy physics. Because of my enthusiasm in imaging, I turned down an offer of joining a therapy physics residency program in Barnes-Jewish Hospital of Washington University in St. Louis and joined Dr. Hazle's section as a research faculty at MD Anderson. During my time as a researcher working with radiologists and clinical physicists (Jeff Shepard and Steve Thompson) in DI, I realized that my knowledge base was so narrowed down in a focused small area of digital x-ray imaging.

I could have stayed in my previous research position while at the same time acquired clinical experiences in different areas gradually. However, I felt that going through a structured clinical training program would better prepare me ready not only for achieving ABR certification but also for developing a sound imaging physics career. I discussed the idea with Dr. Hazle and obtained his support. Though moving from a research faculty position to a trainee was a touch decision, it worked out better for my career development. I greatly appreciate that Dr. Hazle provided the residency training opportunity to me 15 years ago.

What was the most significant, memorable, or surprising event(s) during the program?

- The September 11 attacks in New York (a lot of things have been different since then)
- The program became the 1st CAMPEP accredited Imaging Physics Residency program
- The Section of Imaging Physics (under the Department of Diagnostic Radiology) became the Department of Imaging Physics
- I passed both Part I & Part II of the ABR exam

Who were your mentors and how did they help you to achieve your educational and career goals?
Research Associate, Section of Imaging Physics, Dept. of Diagnostic Radiology, MD Anderson - Mentor: Chris Shaw, Ph.D.
We had many good discussions about research ideas as well as about my career development. I appreciate Dr. Shaw's understanding about my decision of leaving his group for the residency program.

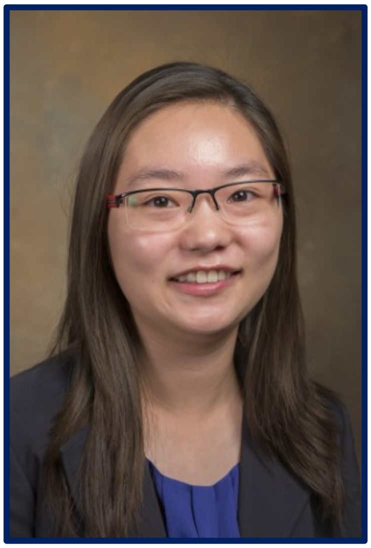
Imaging Physics Resident, Department of Imaging Physics, MD Anderson - Mentor: John Hazle, Ph.D.
Dr. Hazle provided valuable advice before and after I joined his team in MD Anderson. Prior to joining MD Anderson, I had a conversation with him about the profession of medical physics and the field of imaging physics. I was excited about his vision of imaging physics, and when looking back after 17 years, many things have happened pretty much like what he described to me in 1999. I was so impressed with him, his team and MD Anderson, so I joined in 1999 then entered into the residency program in 2001. Throughout my residency training, we held meetings regularly and Dr. Hazle provided directions and support to my career development. At the time of my completion, his advice was one of the key factors with my decision of taking the position in Oklahoma.

What opportunities did you have upon completion and what position do you now hold?
Immediately following my residency at MDA, I started as the primary diagnostic medical physicist in charge of all clinical diagnostic medical physics services to the University Hospital, Presbyterian Hospital, Oklahoma Children's Hospital, University of Oklahoma (OU) Physician's Group, and other clinics and research centers at the OU Medical Center (except the VA Hospital). I was also one of the six primary faculty of the Medical Physics Educational Program there. Without my MDA residency experience, it might not be possible for me to take over that much responsibility and practiced successfully.

I rejoined MD Anderson in 2006 and have been supporting CT Physics in Diagnostic Imaging. Since 2009, I have been serving as the Department Quality Officer for Imaging Physics. In 2015, I became the first medical physicist who is certified by the American Board of Medical Quality.

2016 Student Spotlight Hannah Lee

Mentor: Geoffrey Ibbott, Ph.D.



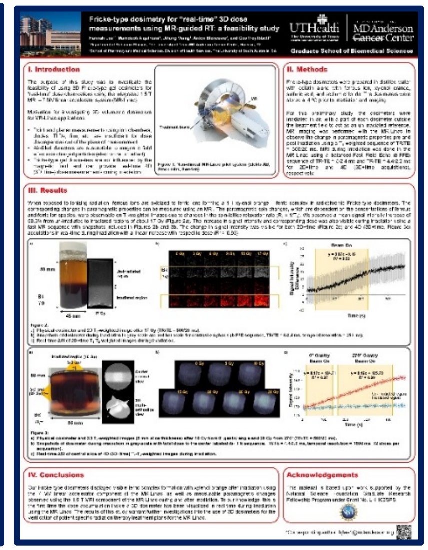
Best Physics Poster Award

Hannah Lee, Mamdooh Alqathami, Jihong Wang, Anton Blencowe & Geoffrey Ibbott

Fricke-type dosimetry for "real-time" 3D dose measurements Using MR-guided RT: a feasibility study

ESTRO 35 Conference
April 29 – May 3, 2016
Turin, Italy

The European Society for Radiotherapy & Oncology (ESTRO) is a scientific, non-profit organization for Radiation Oncologists, Medical Physicists, Radiobiologists, and Radiation Therapists to promote innovation and research in the oncology field.



Other Oral & Poster Presentations

2016 Southwest Chapter AAPM Meeting
March 31 – April 2, 2016
New Orleans, LA

I. HJ Lee, M Alqathami, M Kadbi, J Wang, A Blencowe, G Ibbott. Investigation of iron reduction and oxidation radiation reporting systems as 3D dosimeters for MR-guided radiation therapy and other applications.

AAPM 2016, 58th Annual Meeting and Exhibition
July 31 – August 4, 2016
Washington, DC

I. HJ Lee, M Alqathami, M Kadbi, J Wang, A Blencowe, G Ibbott. Comparison between Fricke-type 3D radiochromic dosimeters for real-time dose distribution measurements in MR-guided radiation therapy. AAPM 58th Annual Meeting & Exhibition. Accepted as ePoster.

II. HJ Lee, M Alqathami, M Kadbi, J Wang, A Blencowe, G Ibbott. Novel iron-based radiation reporting systems as 4D dosimeters for MR-guided radiation therapy. AAPM 58th Annual Meeting & Exhibition. Accepted as oral presentation.

III. M Alqathami, HJ Lee, G Choi, A Blencowe, Z Wen, J Adamovics, G Ibbott. Development of novel radiochromic films for radiotherapy dosimetry. AAPM 58th Annual Meeting & Exhibition. Accepted as ePoster.

IV. G Choi, HJ Lee, M Alqathami, G Ibbott. Using 3D dosimeters for the investigation of the electron return effect (ERE) in MR-guided radiation therapy: A feasibility study. AAPM 58th Annual Meeting & Exhibition. Accepted as oral presentation.

Recently Awarded

- GSBS Student Travel Award
- SWAAPM Young Investigator's Symposium 2nd Place Award
- 2016 Radiation Research Society (RRS) Scholars-in Training travel Award

Ongoing Awards

- National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Fellow (3 years)

These are competitive and prestige fellowships supporting outstanding graduate students in NSF-supported disciplines. Fellows like Hannah are anticipated to become the future knowledge experts and make significant contributions in their field.

- GSBS Faculty & Alumni Merit Fellowship (4 years)

An award recognizing outstanding academic achievements and scholarly potential. Receiving this fellowship indicates a ranking at the very top of the program applicants and serves as an expression of the faculty's confidence in Hannah's ability.

Knudson Outstanding Dissertation Award

Medical Physics Program Graduate Jessica Nute, Ph.D.

GSBS alumna Jessica Nute, Ph.D., was named the recipient of the 2015 Alfred G. Knudson, M.D., Ph.D., Outstanding Dissertation Award. Her dissertation, *Characterization of low density intracranial lesions using dual-energy computed tomography*, investigated the application of Dual-Energy CT to the differentiation of intracranial hemorrhage from calcification below the attenuation level currently possible using clinically available modalities, thus facilitating the safe administration of anticoagulant therapies to patients with suspected hemorrhage.

Intracranial lesion phantom with various size hemorrhage and calcification lesion models visible.

This $1,000 award was established by MD Anderson in 1997 to honor Dr. Knudson, the former GSBS Dean and his landmark contributions to the field of genetics. The award is given to a GSBS graduate whose Ph.D. dissertation is selected as the most outstanding in cancer research. It also acknowledges the important scientific supervision that MD Anderson faculty members provide for GSBS students.

Dr. Nute graduated from GSBS in 2015 with a Ph.D. in Medical Physics. Her advisor was Dianna Cody, Ph.D., Professor and Deputy Chair, Imaging Physics. Today, Dr. Nute is a diagnostic medical physicist at Cedars-Sinai Medical Center in Los Angeles, CA.

Advisory Committee

Dianna Cody, Ph.D.
(Advisor & Committee Chair)

Dawid Schellingerhout, M.D.

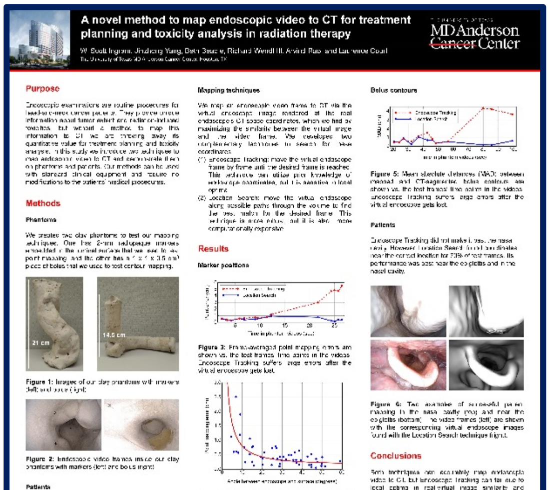
Lucia LeRoux, Ph.D.

John Rong, Ph.D.

Donna Reeve, M.S.

Veera Baladandayuthapani, Ph.D.

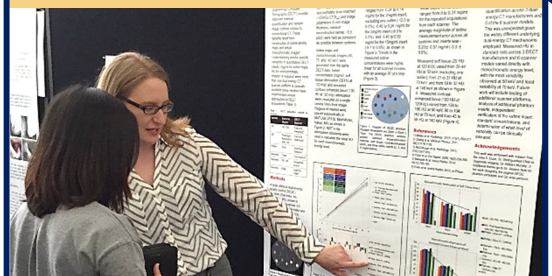
Local and Regional Presentations



1st place at 2016 SWMMPM Spring Meeting

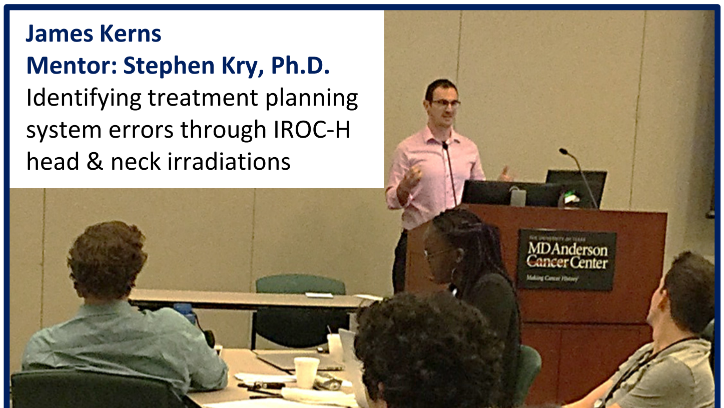
Scott Ingram
Mentor: Laurence Court, Ph.D.
A novel method to map endoscopic video to CT for treatment planning and toxicity analysis in radiation therapy

2016 GSBS Student Research Day Poster Competition



Megan Jacobsen
Mentor: Dianna Cody, Ph.D.
Dual-energy CT iodine quantification and monochromatic image consistency across vendors and platforms

James Kerns
Mentor: Stephen Kry, Ph.D.
Identifying treatment planning system errors through IROC-H head & neck irradiations

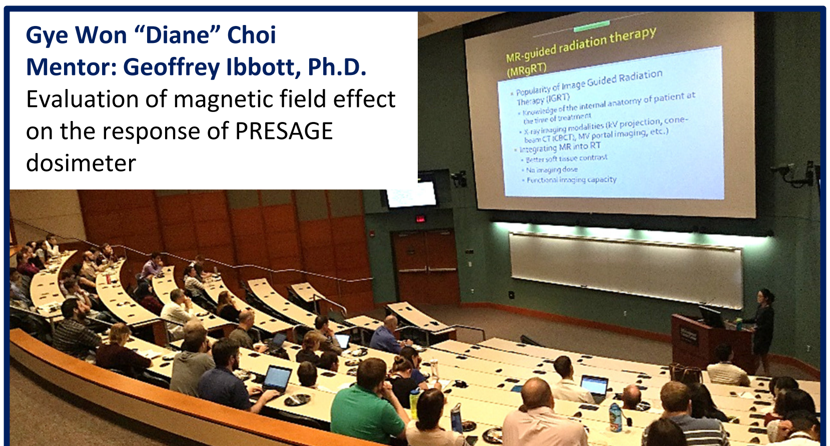


8th Annual Student Research Retreat

Medical Physics Summer Seminar Series

Wendy "Siman" Siman
Mentor: Cheenu Kappadath, Ph.D.
Effects of image noise and reconstruction parameters on tumor dosimetry using 90Y PET/CT imaging

Gye Won "Diane" Choi
Mentor: Geoffrey Ibbott, Ph.D.
Evaluation of magnetic field effect on the response of PRESAGE dosimeter



Medical Physics Summer Seminar Series

A novel Bloch-McConnell simulator for perfused hyperpolarized substrates

Christopher M Walker[1], and James A Bankson[1],

[1]Department of Imaging Physics, The University of Texas M.D. Anderson Cancer Center, Houston, TX

THE UNIVERSITY OF TEXAS MDAnderson Cancer Center

CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Objectives

Clinically, magnetic resonance spectroscopy has seen limited use due to the low signal of compounds of interest. Dissolution dynamic nuclear polarization enhances the magnetic resonance signal from select organic compounds by a more than 10,000 fold. Such a dramatic signal increase has allowed real time dynamic magnetic resonance spectroscopy of hyperpolarized (HP) agents to be readily performed *in-vivo* with unprecedented sensitivity, specificity, and resolution[1,2,3].

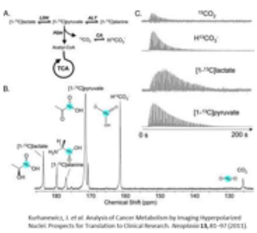
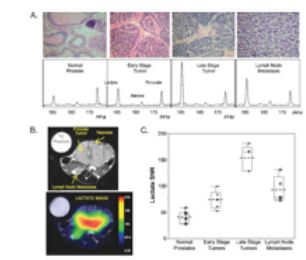


Figure 2. A. the metabolic branch under most investigation by hyperpolarized MR. B. a high resolution MR spectrum of hyperpolarized pyruvate and its metabolites C. a typical time course of real-time dynamic HP MRS.

Kurhanewicz, J. et al. Analysis of Cancer Metabolism by Imaging Hyperpolarized Nuclei: Prospects for Translation to Clinical Research. Neoplasia 13, 81–97 (2011).



Albers, M. J. et al. Hyperpolarized 13C Lactate, Pyruvate, and Alanine: Noninvasive Biomarkers for Prostate Cancer Detection and Grading. Cancer Res 68, 8607–8615 (2008).

Most present investigations in the field of HP MR have focused on HP pyruvate due to its central role in metabolism and altered fate in cancer. The cellular conversion rate of HP pyruvate to lactate, as measured by HP MRS, has shown strong correlation to presence and stage of disease as well as response to therapy [1,2].

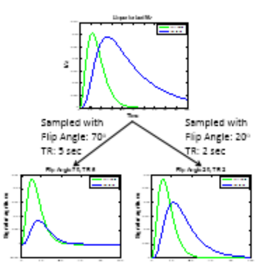


Figure 2. The actual metabolic time course of hyperpolarized pyruvate and lactate assuming no sampling(top). The results of two different sampling strategies applied to the top time courses (bottom)

The signal from hyperpolarized metabolites is fundamentally different from conventional MR. It is unclear what effect detection and processing methods will have on quantitative analyses. A novel simulation platform has been developed to simulate MR studies of hyperpolarized agents in silico [4]. Here we explore the effects of detection parameters such as flip angle and sampling rate on the accuracy of the quantitative metabolic imaging biomarker k_{pl}, which reflects the apparent rate of chemical conversion for HP pyruvate into lactate[3].

Methods

Simply modeling the spin physics involved in hyperpolarized MR does not capture biological barriers and interactions that mediate activity *in vivo*. By coupling the physical models fundamental to magnet resonance to models of chemical exchange and physiologic perfusion (Equation 1) it is possible to meaningfully simulate in-vivo hyperpolarized studies.

$$\frac{dM_{P_{ev}}}{dt} = \gamma(M_{P_{ev}} \times B) - \left(R_P + k_{pl} + \frac{k_{ev}}{v_e}\right) M_{P_{ev}} + \frac{k_{ev}}{v_e} M_{P_v}$$

$$\frac{dM_{L_{ev}}}{dt} = \gamma(M_{L_{ev}} \times B) + R_L M_{L_{ev}} + k_{pl} M_{L_{ev}}$$

$$M_{P_v} = \Gamma(t)$$

Equation 1. mathematic model of an in-vivo conversion of hyperpolarized pyruvate to lactate assuming gamma distribution as a model of perfusion and combining cellular uptake with rate of conversion.

To investigate how acquisition parameters used affect our observations, we generated synthetic data using a perfused Bloch-McConnell simulator (Eq. 1) and analyzed it using a two-pool, two site model [ref]. The resulting modeled conversion rate was compared to the rate constant used to generate the data to determine accuracy. This process is represented schematically in figure 3.

The two measurement parameters investigated were excitation angle and the repetition time. Both rapid and moderate metabolic conversion rates were modeled under perfused and closed system assumptions.

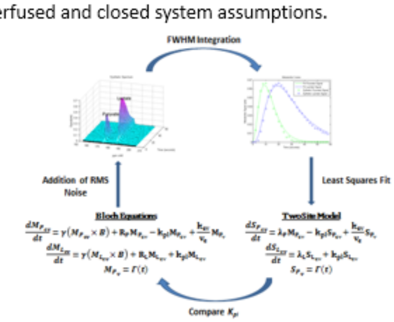


Figure 3. Schematic of how data was simulated with the Bloch equations, processed and modeled with a two site model . The modeled results were then compared to the simulation input.

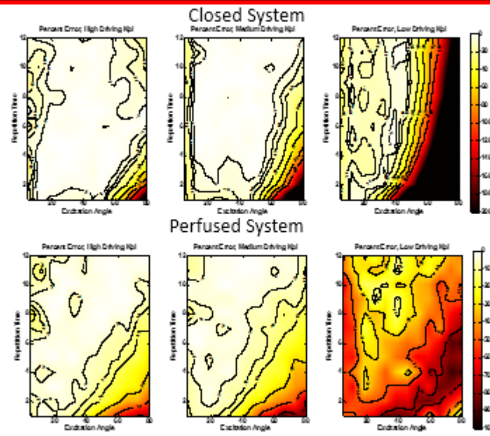


Figure 5. Percent accuracy plots for low (right) and rapid (left) basal metabolic conversion. The closed system (top) simulates a non perfused system. The perfused system (bottom) models agent delivery and wash out.

Results

Under the closed system approximation, there are a wide range of flip angle and repetition times that yield accurate detection of conversion rate. The perfused systems, in contrast, has a more limited measurement parameters that result in accurate measurements. The set of parameters that yield most accurate result are different for the moderate and high basal conversion rate. Despite the dependence on basal conversion rate, there are many regions were all three conversion rates simulated yield accurate fit results.

Conclusion

While the closed system performs well under a range of conditions, it is also not a realistic model of tissue. The perfused model more faithfully models living systems and has a larger dependence on measurement parameters. This dependence holds even though the measurement parameters used are accounted for in the modeling. Moreover, the fit residuals were low and relatively uniform across all acquisition parameters (not shown) making it unlikely that the inaccuracy is due to poor fit performance. These complex data sets have inherent sampling strategy biases that can be minimized across a range of parameters by careful acquisition design. As such it will be critical that investigators in this field consider carefully the acquisition strategies used when designing, comparing, or analyzing studies of hyperpolarized agents in living systems.

Acknowledgements

This work was supported by the Cancer Prevention & Research Institute of Texas (RP140021-P5), a Julia Jones Matthews Cancer Research Scholar/CPRIT research training award (RP140106, C.M.W.) and the National Institutes of Health (P30-CA016672)

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2. Cancer Res. 2015 Nov 15;75(22):4708-17. doi: 10.1158/0008-5472
3. Cancer Res. 2008 Oct 15; 68(20): 8607–8615 doi:10.1158/0008-5472.CAN-08-0749
4. Med Phys. 2016 Feb;43(2):854. doi: 10.1118/1.4939877

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Magnetic Resonance Systems Lab

ISMRM 2015 Toronto

1st Place Winner

Chris Walker

Ph.D. Program

Mentor: James Bankson, Ph.D.

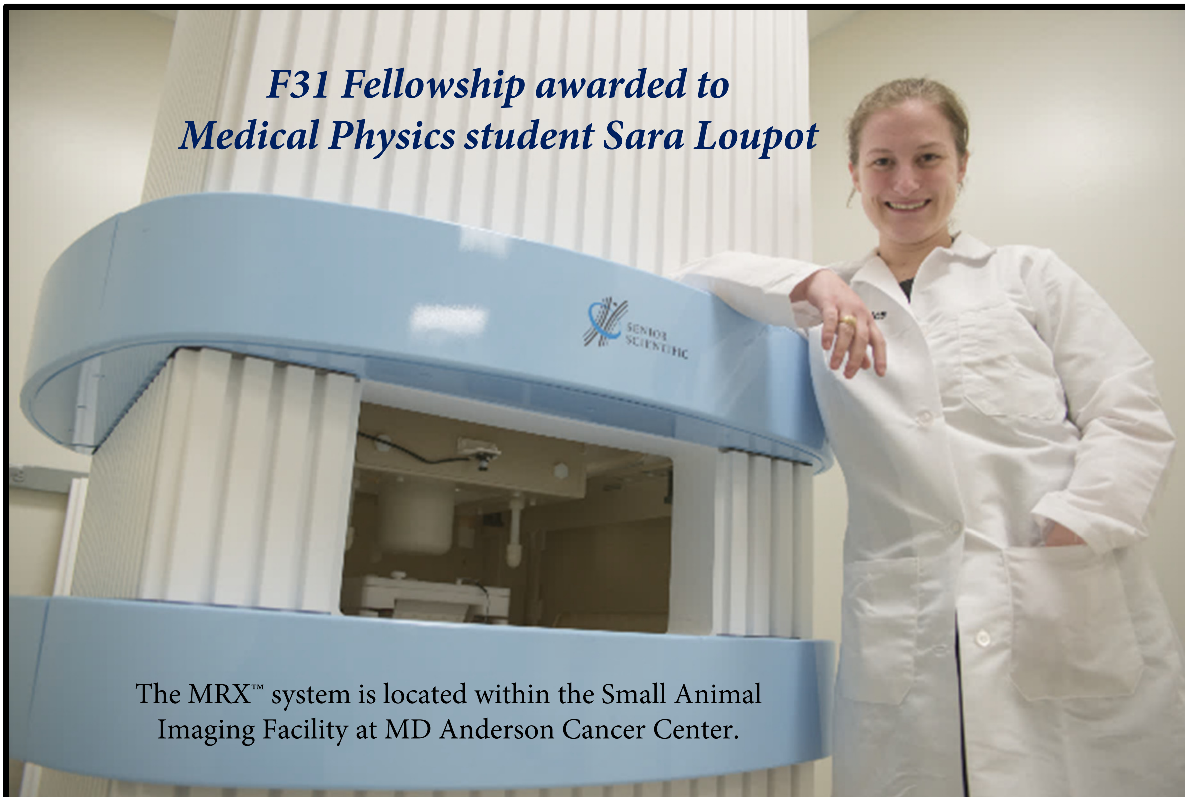
2016 Diagnostic Imaging

Trainee Research Symposium

April 14, 2016

This inaugural event offered the opportunity for faculty and trainees to engage and learn about the research that other groups are working on within the Division of Diagnostic Imaging and will hopefully lead to potential future collaborations.

F31 Fellowship awarded to Medical Physics student Sara Loupot



The MRX™ system is located within the Small Animal Imaging Facility at MD Anderson Cancer Center.

Sara Loupot is wrapping up her third year in the Medical Physics Program with great news. She was just awarded a National Cancer Institute Ruth L. Kirschstein National Research Service Award (NRSA) Individual Predoctoral Fellowship. This award, targeted to talented doctoral candidates training in cancer related fields, will support Sara's stipend and tuition for the remaining two years of her training.

Sara's research efforts are with the Magnetic Relaxometry Research Laboratory where Drs. John Hazle and Robert Bast are implementing a novel technology for early cancer detection – initially focusing on the early detection of ovarian cancer.

The MRX™ device, developed by Senior Scientific, LLC, performs magnetic relaxometry using an array of ultra-sensitive Superconducting Quantum Interference Devices (SQUIDs) to detect cancer cell-bound superparamagnetic iron oxide nanoparticles by leveraging the difference in relaxation properties of tumor-bound nanoparticles from those with unrestricted motion – those in the vascular or extracellular spaces.

Sara's dissertation research specifically focuses on the development of a sparse reconstruction algorithm to localize and quantify the bound particles from the magnetic field values measured by the MRX™ system. She's working with Drs. David Fuentes and John Hazle on this aspect of the project. MD Anderson is the first research institution to have the MRX™ technology which provides Sara with a true pioneering opportunity as a student.

PI: Sara Loupot
Title: A Sparse Reconstruction Algorithm for Superparamagnetic Relaxometry
Sponsor: NIH

Proposed Changes to the Medical Physics Curriculum

The Faculty Curriculum Review Committee (FCRC) was charged by the Medical Physics Program Steering Committee to review the current curriculum and to develop a plan for ongoing review and audit. In response to this charge, the FCRC reviewed the current curriculum in consideration of CAMPEP requirements, ABR requirements, AAPM Report 197, feedback from the Student Curriculum Review Committee (SCRC), and feedback from Medical Physics program faculty.

The ad-hoc SCRC provided insightful feedback that focused on several key areas:

Quality of courses: lack of coordination between instructors, lack of feedback from course instructors, and redundancy across the curriculum

Content of courses: educational gaps, amount of content vs. number of credit hours, extend/reduce scope of certain courses

Clinical rotation courses: practical experience is important, time could be used more efficiently, redundancy

In considering this feedback, the FCRC worked with general goals. These included ensuring that the Medical Physics Program curriculum is modern, meets CAMPEP standards and ABR requirements, and provides sufficient elective opportunities for program students. The FCRC also developed a process for ongoing review of the program curriculum to continue meeting these goals.

In the end, a number of specific recommendations were submitted to the program faculty by the FCRC:

1. Addition of an Ethics module to the Spring Seminar course.
2. Reducing the Electronics course to two hours.
3. Splitting Applied Mathematics into two required courses, Statistics for Medical Physics and Imaging Science.
4. Eliminating the Introductory Radiation Therapy Physics Rotation and Introductory Diagnostic Imaging Rotation
5. Adding a 1 hour lab practicum to each of Medical Physics II, III, and IV, the goal of the practica being to reinforce key didactic concepts from the course in close temporal proximity to the introduction of the concepts.
6. Adding one or more Clinical Survey courses in Imaging and Therapy.
7. Combining basic content from Fundamental Biological Principles of Molecular Imaging and Therapeutics, Radiation Biology, and Anatomy and Oncology for Medical Physicists into a two semester, six hour course: Fundamental Biology, Physiology and Anatomy for Medical Physicists. Reconfigure remaining content from Fundamental Biological Principles of Molecular Imaging and Therapeutics into a new Molecular Imaging course.

Finally, a number of Best Practices Recommendations for course coordinators were published.

The FCRC believes its recommendations address several key weaknesses in the current Medical Physics curriculum. Further, the recommended changes would reduce the number of required credit hours from 50 to 45, more closely associate hands-on and practical experience with didactic concepts, rebalance credit hour load, and eliminate gaps in coverage of CAMPEP-required content that currently exist in the curriculum. Also important to the continued development and relevancy of the Medical Physics curriculum is the development and offering of targeted elective courses on current topics in medical imaging, radiation therapy, and medical physics.

The Medical Physics Program is currently working to develop the new curriculum for implementation during Fall 2017. A half-day retreat just before AAPM will be used to allow course coordinators to begin work on the new curriculum.

Members of the Faculty Curriculum Review Committee participate in an exercise to group key concepts from Medical Physics Program courses to identify areas for curriculum restructuring.

Doctor of Medical Physics

Summary of the Assessment of the Need for a Doctor of Medical Physics (DMP) Program

The Doctor of Medical Physics degree is a professional doctorate that includes two years of didactic education in medical physics and two years of clinical training in one of the specialties of medical physics. It is thus equivalent in scope to a professional master's degree plus a clinical residency. With suitable accreditation of the program, the American Board of Radiology would accept graduates of such a program into its certification process.

We conducted a survey of the need for a Doctor of Medical Physics Program to be offered by the School of Health Professions of The University of Texas MD Anderson Cancer Center in January and February of 2016. We surveyed 423 alumni, faculty members, current students and friends of the Graduate Program in Medical Physics of The University of Texas Graduate School of Biomedical Sciences at Houston. We also publicized the survey in the newsletter of the Society of Physics Students in order to get the perspective of undergraduate physics majors.

One hundred fourteen surveys were started, but not all of the respondents answered all of the questions. Fifteen respondents were students. Fifty-five were alumni of a graduate program in medical physics. Seventy practice medical physics, 17 employ or manage medical physicists and 31 teach students in physics or medical physics. Almost two-thirds of the respondents work in an academic medical center. Almost half of the respondents were from Texas and only one was from outside of the U.S.

Those who mentioned retirement plan to work almost 21 more years, on the average, with a relatively level distribution of planned years of working. It appears that about 3% of medical physics positions would open up each year due to retirement.

Ninety percent of hiring is for therapy positions, half is for imaging, almost a third is for nuclear medicine and a fifth is for health physics. These figures reflect the fact that many jobs span two or more specialties of medical physics. Almost two-thirds of employers find it relatively easy to find qualified applicants when they are hiring.

Of the students who responded, more than half were likely or very likely to consider studying in a DMP program. The distribution of interest in studying the various specialties of medical physics is very similar to the distribution of jobs in those specialties. The survey inquired about multi-specialty programs. Two-thirds would be interested in studying both therapy and imaging physics, a fifth would be interested in studying imaging and nuclear medicine physics and not quite half would be interested in studying therapy, imaging and nuclear medicine physics.

Questions about the desirability of job applicants with different preparations indicated that 80% of respondents find an MS plus a residency desirable. All but one viewed a Ph.D. plus residency as desirable. Slightly more than half found a Ph.D. plus post-doctoral fellowship desirable. Almost a third considered a Ph.D. plus post-doc plus residency to be desirable. Three-quarters viewed a DMP as desirable. Three-quarters viewed a non-medical physics Ph.D. plus a certificate plus a residency to be desirable. It thus appears that the DMP would be viewed similarly to an MS plus residency in the job market. It is clear that very few respondents are in organizations that do not require their medical physicists to have clinical training.

While it is unsurprising that the respondents tended to view a lower cost more favorably than a higher cost, the sweet spot for the cost to the student appears to be around $20,000 a year. The number of respondents who would be willing to pay more than that amount dropped rapidly as the figure increased further. Very few thought that their employers would explicitly help a new employee to retire debt incurred in acquiring the DMP degree.

The survey received 45 free form comments. They ranged from enthusiastic support to skepticism and frank discouragement. There were several suggestions for how to design the curriculum, with strong support for including research in the education of the DMP candidate.

Overall, the survey demonstrated a strong interest in DMP programs. Although the number of students who responded was small, there appears to be an appreciable interest in the DMP among them. The results suggest that DMP graduates would be competitive for most of the jobs in medical physics.

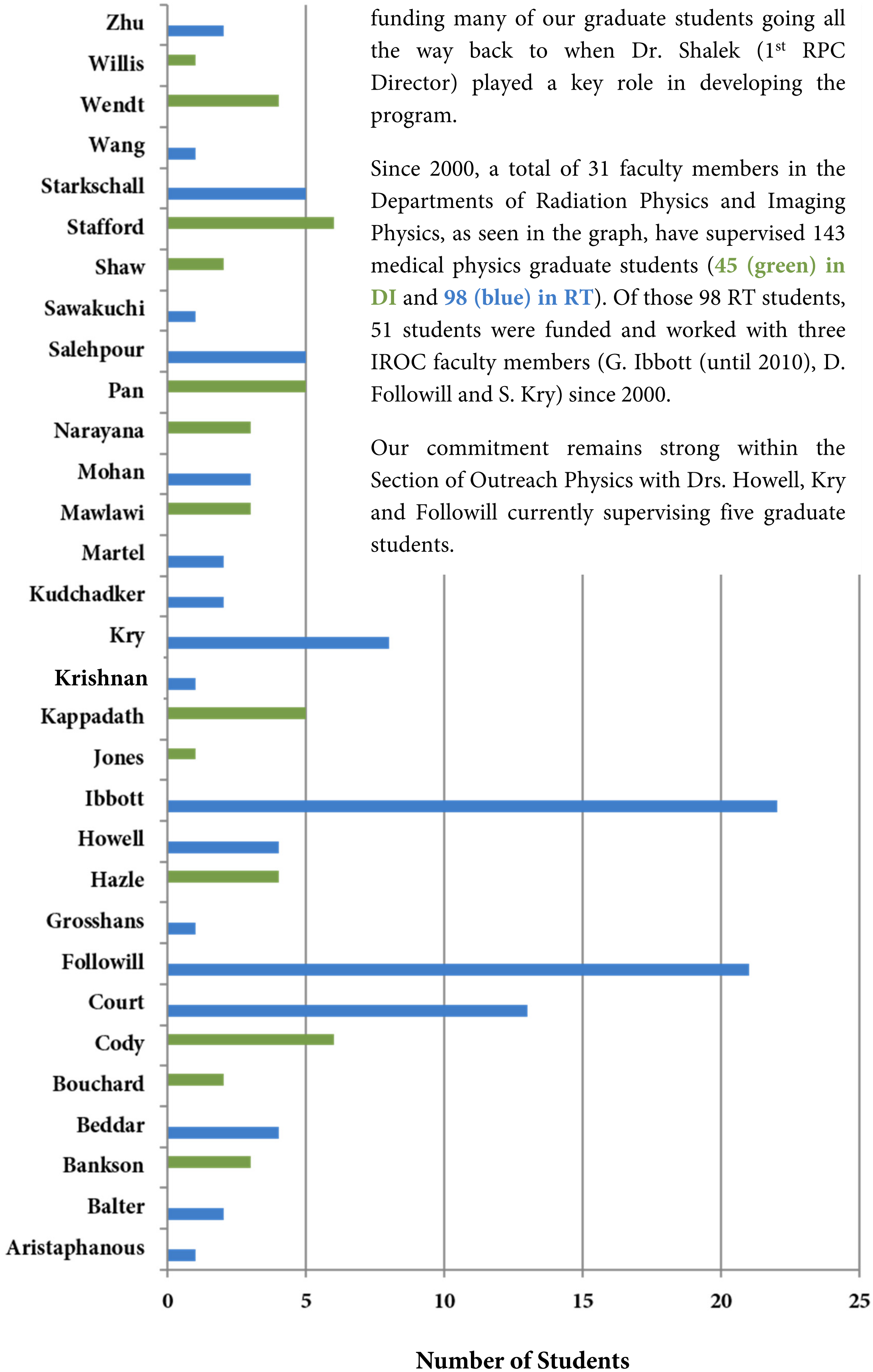
We are grateful to the many alumni and friends of the program who participated in this assessment.

The IROC Houston QA Center

The IROC Houston QA Center (formerly the RPC) has always been a huge supporter of the Medical Physics Graduate Program advising and funding many of our graduate students going all the way back to when Dr. Shalek (1st RPC Director) played a key role in developing the program.

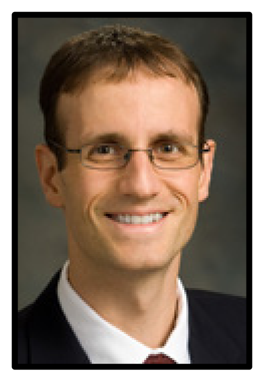
Since 2000, a total of 31 faculty members in the Departments of Radiation Physics and Imaging Physics, as seen in the graph, have supervised 143 medical physics graduate students (**45 (green) in DI** and **98 (blue) in RT**). Of those 98 RT students, 51 students were funded and worked with three IROC faculty members (G. Ibbott (until 2010), D. Followill and S. Kry) since 2000.

Our commitment remains strong within the Section of Outreach Physics with Drs. Howell, Kry and Followill currently supervising five graduate students.



David S. Followill, Ph.D.
Professor
Radiation Physics
Director, IROC

Rebecca M. Howell, Ph.D.
Associate Professor
Radiation Physics
Director, Late Effects Group



Stephen F. Kry, Ph.D.
Assistant Professor
Radiation Physics
Associate Director, IROC

Sunday, July 31st

AAPM 2016 Presentations by Students in the Medical Physics Program

Authors whose work was done as a graduate student (including some recently graduated alumni)

1:00 -1:55 PM Ballroom A

SU-C-BRA-5 ***C. Cardenas,*** A. Wong, A. Mohamed, J. Yang, L. Court, A. Rao, C. Fuller, M. Aristophanous, Delineating High-Dose Clinical Target Volumes for Head and Neck Tumors Using Machine Learning Algorithms.

2:05 – 3:00 PM Ballroom C

SU-D-BRC-7 C. Darne, D. Robertson, ***F. Alsanea,*** S. Beddar, System Design for a 3D Volumetric Scintillation Detector Using SCMOS Camera.

3:00 – 6:00 PM Exhibit Hall

SU-F-J-2 ***S. Fahrenholtz***, R. Stafford, R. Madankan, J. Hazle, D. Fuentes, Flexible Training of MR-Guided Laser Ablation Models via Global Optimization.

SU-F-J-3 R. Madankan, ***C. MacLellan, S. Fahrenholtz***, J. Weinberg, G. Rao, J. Hazle, R. Stafford, D. Fuentes, Treatment Planning for Laser Ablation Therapy in Presence of Heterogeneous Tissue: A Retrospective Study.

SU-F-J-50 Z. Wen, F. Therriault-Proulx, ***C. Owens***, G. Ibbott, S. Beddar, Study on the Magnetic Field Effect on the Exradin W1 Plastic Scintillation Detector.

SU-F-J-115 ***R. Martin***, T. Pan, Target Volume and Artifact Evaluation of a New Device-Less 4D CT Algorithm.

SU-F-J-224 ***J. Meier, B. Lopez***, O. Mawlawi, Impact of 4D PET/CT on PERCIST Classification of Lung and Liver Metastases in NSLLC and Colorectal Cancer.

SU-F-R-9 D. Mackin, L. Court, C. Ng, J. Yang, L. Zhang, ***X. Fave***, Homogenization of CT Images for Radiomics Studies: It's Like Butter(worth).

SU-F-T-120 S. ***Ge, X.*** Wang, R. Mohan, How Many and Which Respiratory Phases Should Be Included During the 4D Robust Optimization Process.

SU-F-T-122 U. Titt, D. Mirkovic, P. Yepes, A. Liu, ***C. Peeler***, S. Randenyia, R. Mohan, 4D and 5D Proton Dose Evaluation with Monte Carlo.

SU-F-T-130 ***D. Kim***, U. Titt, D. Mirkovic, [18F]-FDG Uptake Dose Response in Lung Correlates Linearly with Proton Therapy Dose.

SU-F-T-164 ***M. Carroll***, M. Alqathami, G. Ibbott, Investigation of PRESAGE Formulation on Signal Quenching in a Proton Beam.

SU-F-T-168 ***D. Branco,*** *P.* Taylor, S. Frank, H. Li, X Zhang, H. Mehrens, M. Guindani, D. Followill, Development and Implementation of an Anthropomorphic Head & Neck Phantom for the Assessment of Proton Therapy Treatment Procedures.

SU-F-T-181 P. Taylor, ***D. Craft***, D. Followill, R. Howell, Proton Therapy Tissue-Equivalence of 3D Printed Materials.

SU-F-T-187 ***M. Newpower, S. Ge***, R. Mohan, Quantifying Normal Tissue Sparing with 4D Robust Optimization of Intensity Modulated Proton Therapy.

3:00 – 6:00 PM Exhibit Hall, continued

SU-F-T-193 R. Taleei, ***C. Peeler***, N. Qin, S. Jiang, X. Jia, Evaluation of a GPU-Based Fast Monte Carlo Code for Proton Therapy Biological Optimization.

SU-F-T-423 ***K. Kisling***, L. Zhang, J. Yang, A. Jhingran, P. Balter, ***R. McCarroll***, B. Beadle, R. Howell, K. Schmeler, L. Court, Automating Treatment Planning for Cervical Cancer in Low- and Middle-Income Countries.

SU-F-T-665 D. Sadetaporn, ***D. Flint***, C. McFadden, A. Asaithamby, G. Sawakuchi, Confocal Microscopy Imaging of Cell Cycle Distribution in Cells Treated with Pegylated Gold Nanoshells.

4:00 – 6:00 PM Ballroom A

SU-G-BRA-11 ***R. Martin***, M. Ahmad, T. Pan, Tumor Tracking in an Iterative Volume of Interest Based 4D CBCT Reconstruction.

4:00 – 6:00 PM Ballroom B

SU-G-BRB-2 ***J. Kerns***, D. Yaldo, An Open-Source Software Analysis Library for Linear Accelerator Quality Assurance.

4:00 – 6:00 PM Room 206

SU-G-206-7 ***M. Jacobsen, C. Wood***, D. Cody, Dual-Energy CT Inter- and Intra-Scanner Variability within One Make and Model.

4:30 – 5:00 ePoster Theater

SU-G-JeP2-4 ***H. Lee***, M. Alqathami, M. Kadbi, J. Wang, A. Blencowe, G. Ibbott, Comparison between Fricke-Type 3D Radiochromic Dosimeters for Real-Time Dose Distribution Measurements in MR-Guided Radiation Therapy.

SU-G-TeP2-6 M. Alqathami, ***H. Lee, G. Choi***, A. Blencowe, Z. Wen, J. Adamovics, G. Ibbott, Development of Novel Radiochromic Films for Radiotherapy Dosimetry.

5:30 – 6:00 PM ePoster Theater

SU-G-IeP4-15 ***T. Mitcham,*** R. Bouchard, A. Melancon, M. Eggers, M. Melancon, Ultrasound Imaging of Absorbable Inferior Vena Cava Filters for Proper Placement.

Monday, August 1st

1:45 – 3:45 PM Room 207B

MO-DE-207B-10 ***D. Fried***, L. Zhang, ***X. Fave***, G. Ibbott, S. Zhou, O. Mawlawi, Z. Liao, L. Court, Impact of Morphologic Characteristics on Radiomics Features from Contrast-Enhanced CT for Primary Lung Tumors.

MO-DE-207B-7 ***D. Fried, J. Meier***, O. Mawlawi, S. Zhou, G. Ibbott, Z. Liao, L. Court, Assessment of Reproducibility of FDG-PET-Based Radiomic Features across Scanners Using Phantom Imaging.

4:30 – 6:30 PM Room 202

MO-FG-202-5 **J. Kerns**, D. Followill, R. Howell, A. Melancon, F. Stingo, S. Kry, Identifying Treatment Planning System Errors in IROC-H Phantom Irradiations.

Tuesday, August 2nd

7:30 – 9:30 AM **Room 202**
TU-AB-202-12 ***W. Ingram***, J. Yang, B. Beadle, R. Wendt, A. Rao, L. Court, A Novel Method to Map Endoscopic Video to CT for Treatment Planning and Toxicity Analysis in Radiation Therapy.

7:30 – 9:30 AM **Ballroom C**
TU-AB-BRC-2 R. Taleei, *C. Peeler*, N. Qin, S. Jiang, X. Jia, Accuracy Evaluation of GPU-Based OpenCL Carbon Monte Carlo Package (goCMC) in Biological Dose and Microdosimetry in Comparison to FLUKA Simulations.

11:00 AM – 12:15 PM **Room 207B**
TU-D-207B-2 ***X. Fave***, L. Zhang, J. Yang, D. Mackin, F. Stingo, D. Followill, P. Balter, A. Jones, D. Gomez, L. Court, Delta-Radiomics: The Prognostic Value of Therapy-Induced Changes in Radiomics Features for Stage III Non-Small Cell Lung Cancer Patients.

TU-D-207B-1 Z. Zhang, A. Ho, X. Wang, P. Brown, N. Guha-Thakurta, S. Ferguson, ***X. Fave***, L. Zhang, D. Mackin, L. Court, J. Li, J. Yang, A Prediction Model for Distinguishing Radiation Necrosis from Tumor Progression after Gamma Knife Radiosurgery Based on Radiomics Features from MR Images.

4:30 – 5:00 PM **ePoster Theater**
TU-H-CAMPUS-JeP1-2 ***R. McCarroll***, B. Beadle, J. Yang, L. Zhang, M. Mejia, ***K. Kisling***, P. Balter, F. Stingo, C. Nelson, D. Followill, L. Court, Fully Automatic Verification of Automatically Contoured Normal Tissues in the Head and Neck.

TU-H-CAMPUS-TeP1-2 ***R. McCarroll***, B. Beadle, D. Fuller, P. Balter, D. Followill, F. Stingo, J. Yang, L. Court, Seated Treatment: Setup Uncertainty Comparable to Supine.

4:30 – 6:00 PM **Room 206**
TU-H-206-7 K. Hwang, *J. Meier*, J. Yung, R. Stafford, Assessment of Geometric Distortion in EPI with a SPAMM-Tagged Acquisition.

4:30 – 6:00 PM **Room 207A**
TU-H-207A-3 ***H. Ai***, R. Wendt, CT Hounsfield Unit Accuracy: Effect of Beam Hardening on Phantom and Clinical Whole-Body CT Images.

4:30 – 6:00 PM **Ballroom C**
TU-H-BRC-8 ***D. Craft***, W. Woodward, J. Kanke, S. Kry, M. Salehpour, R. Howell, Use and Validation of Flexible 3D Printed Tissue Compensators for Post-Mastectomy Radiation Therapy.

5:00 – 5:30 PM **ePoster Theater**
TU-H-CAMPUS-TeP2-1 ***A. Rubinstein***, C. Kingsley, A. Melancon, R. Tailor, J. Pollard, M. Guindani, D. Followill, J. Hazle, L. Court, A Comparison of Noninvasive Techniques to Assess Radiation-Induced Lung Damage in Mice.

5:30 – 6:00 PM **ePoster Theater**
TU-H-CAMPUS-IeP3-3 J. Lin, D. Fuentes, A. Chandler, J. Hazle, D. Schellingerhout, ***C. MacLellan***, Validation of Image Registration Methods for Brain Magnetic Resonance Imaging.

Wednesday, August 3rd

7:30 – 9:30 AM **Ballroom A**
WE-AB-BRA-4 ***C. MacLellan***, D. Fuentes, H. Espinoza, S. Prabhu, G. Rao, J. Weinberg, R. Stafford, Investigation of MRI-Derived Thermal Dose Models.

1:45 – 3:45 PM **Room 202**
WE-GF-202-9 ***C. Peeler***, D. Mirkovic, U. Titt, D. Grosshans, R. Mohan, Voxel-Level Analysis of Adverse Treatment Response in Pediatric Patients Treated for Ependymoma with Passive Scattering Proton Therapy.

WE-FG-202-12 ***R. Ger***, M. Awan, A. Mohamed, Y. Ding, S. Frank, R. Howell, H. Li, H. Liu, R. Mohan, Investigation of Longitudinal Salivary Gland DEC-MRI Changes.

1:45 – 3:45 PM **Ballroom A**
WE-FG-BRA-4 C. McFadden, ***D. Flint***, D. Sadetaporn, A. Asaithamby, D. Grosshans, G. Sawakuchi, A Portable Confocal Microscope to Image Live Cell Damage Response Induced by Therapeutic Radiation.

1:45 - 3:45 PM **Room 207B**
WE-FG-207B-8 ***M. Jacobsen***, ***C. Wood***, D. Cody, Dual-Energy CT Iodine Accuracy across Vendors and Platforms.

4:30 – 6:00 PM **Ballroom A**
WE-H-BRA-1 R. Abolfath, ***L. Bronk***, Y. Helo, J. Schuemann, U. Titt, D. Grosshans, R. Mohan, Best in Physics (Therapy): Nano-Dosimetric Kinetic Model for Variable Relative Biological Effectiveness of Proton and Ion Beams.

WE-H-BRA-5 F. Guan, ***L. Bronk***, M. Kerr, X. Wang, Y. Li, ***C. Peeler***, N. Sahoo, D. Patel, D. Mirkovic, U. Titt, D. Grosshans, R. Mohan, Investigation of LET Spectral Dependence of the Biological Effects of Therapeutic Protons.

WE-H-BRA-6 D. Patel, ***L. Bronk***, F. Guan, ***C. Peeler***, D. Mirkovic, D. Grosshans, O. Jakel, A. Abdollahi, U. Titt, R. Mohan, Experimental Investigation of RBE for Lung Cancer Cell Lines as a Function of Dose and LET in Proton, Helium and Carbon Beams.

4:30 – 6:00 PM **Ballroom C**
WE-H-BRC-8 ***M. Carson***, A. Molineu, P. Taylor, D. Followill, S. Kry, Examining Credentialing Criteria and Poor Performance Indicators for IROC-Houston's Anthropomorphic Head and Neck Phantom.

Thursday, August 4th

7:30 - 9:30 AM **Room 201**
TH-AB-201-3 ***C. Cardenas***, P. Nitsch, R. Kudchadker, R. Howell, S. Kry, Characterization of Electron Beam Out-of-Field Doses and Neutron Contamination from Modern Varian and Elekta Linear Accelerators.

7:30 - 9:30 AM **Ballroom A**
TH-AB-BRA-11 ***G. Choi***, ***H. Lee***, M. Alqathami, G. Ibbott, Using 3D Dosimeters for the Investigation of the Electron Return Effect (ERE) in MR-Guided Radiation Therapy: A Feasibility Study.

10:00 AM – 12:00 PM **Room 201**
TH-CD-201-3 ***F. Alsanea***, F. Therriault-Proulx, G. Sawakuchi, S. Beddar, A Real-Time Method to Simultaneously Measure Linear Energy Transfer and Dose for Proton Therapy Using Organic Scintillators.

10:00 AM – 12:00 PM **Room 209**
TH-CD-209-12 M. Kerr, ***L. Bronk***, F. Guan, D. Patel, Y. Li, X. Wang, N. Sahoo, ***C. Peeler***, U. Titt, D. Mirkovic, D. Grosshans, R. Mohan, Spatial Mapping of Scanned Proton Biological Effect Using the High-Throughput Technique, Continued.

10:00 AM – 12:00 PM **Ballroom A**
TH-CD-BRA-1 ***A Rubinstein***, R. Tailor, A. Melancon, J. Pollard, M. Guindani, D. Followill, J. Hazle, L. Court, Best in Physics (Therapy): Field-Induced Dose Effects in a Mouse Lung Phantom: Monte Carlo and Experimental Assessments.

TH-CD-BRA-4 J. Wang, ***A. Rubinstein***, J. Ohrt, G. Ibbott, Z. Wen, Effect of a Strong Magnetic Field on TLDs, OSLDs and Gafchromic Films Using an Electromagnet.

TH-CD-BRA-8 ***H. Lee***, M. Alqathami, M. Kadbi, J. Wang, A. Blencowe, G. Ibbott, Novel Iron-Based Radiation Reporting Systems as 4D Dosimeters for MR-Guided Radiation Therapy.

Annual Alumni Event

Sunday, July 31, 2016
8:00 – 10:30 p.m.

Marriott Marquis

901 Massachusetts Ave NW
Washington, DC 20001

Capitol & Congress rooms
(located on meeting level 4)

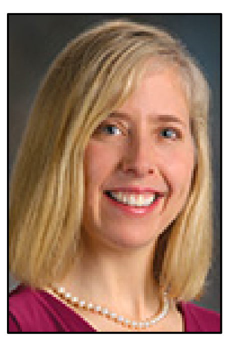
AAPM Awards Ceremony
Monday 8/1/2016
6:30 PM - 8:00 PM
Ballroom A

2016 Class of the Fellows of the AAPM

We are pleased and proud to recognize three members of the 2016 class of Fellows of the AAPM who are alumni or members of the faculty of the medical physics program: Peter Balter, Ph.D., Jennifer Johnson, M.S., M.B.A., and Jihong Wang, Ph.D.

Peter Balter, Ph.D.
Professor
Radiation Physics

GSBS Alumnus
M.S., 1995; Ph.D., 2003



Jennifer Johnson, M.S., M.B.A.
Senior Medical Physicist
Radiation Physics

Jihong Wang, Ph.D.
Associate Professor
Radiation Physics