Medical Physics Alumni

NEWSLETTER

SUMMER 2021 | VO

The IROC-Houston IMRT Head and Neck Phantom takes no chances during the pandemic (photo by Sharbacha Edward)

PROGRAM DIRECTOR'S REPORT

PANDEMIC

MD Anderson took an extremely cautious approach to the pandemic of 2019-2021 in a successful effort to protect our patients from nosocomial infection with the coronavirus. What in normal times is a strength of our program, namely that our students are right in the midst of the healthcare enterprise and not off somewhere on a university campus located miles from an affiliated medical center, proved to be a detriment under these conditions. Our students could not get into their research labs or the classrooms for much of the year. Instruction moved online with mixed results. Two significant problems were the loss of direct interaction in the classroom and the technical issues with unreliable Internet connections as entire apartment complexes suddenly were working from home, but our students and faculty proved to be resilient and rose to the challenge. The Graduate School has worked very hard to support the students' well-being and both MD Anderson and the Health Science Center made their support services available to students. Our students organized a number of activities that maintained and strengthened their cohesion as a group. These are described later in the newsletter. Constance Owens, Emily Thompson, Evan Gates, Ben Musall and Barbara Marquez deserve special thanks for their leadership of the student body in such trying times. It now appears that we will be able to return to a strong semblance of normality by the start of the fall term. When this is all over, there will be a wealth of tales to tell to grandchildren someday about student life during the pandemic.

ADMISSION

We had a very successful admission season. We continue to have a pool of very strong applicants from which to choose and would gladly admit more than we do if we had the resources to support them all. We received 60 applications to the PhD program. We made 12 offers of admission of which 7 were accepted. Of those seven, five will be funded by the Graduate School for their first 16 months of study and two will be funded by the two physics departments at MD Anderson. We will also have an eighth new GSBS-funded PhD student who had to defer his admission from last year due to the pandemic and its attendant travel restrictions.

We received 11 applications to the SMS program. We made three offers of admission of which one was accepted. Since the entire process was virtual this year, we look forward actually to meeting our incoming class in person for the first time in August.

SHALEK FUNDRAISING

The support of the Shalek Fellowships by our alumni, faculty and friends enabled us to offer support of the first two semesters' stipend and the first years' tuition and fees of our incoming SMS student, Rachel Glenn. We had a strong response to our appeal this year with many new donors. The details of this year's fundraising are given elsewhere in this newsletter, but the gratitude of the program for helping our students on the path to joining our profession cannot be repeated in too many places. Thank you to all who support the work of the program.

DEFENSES AND GRADUATION

We had a number of students who defended their dissertations in the Spring of 2020 but deferred their formal graduations until later in the year because of the uncertainties in when residencies and fellowships would start. As a consequence, we had twelve PhD students formally graduate in the cycle for the 2021 Commencement. If you would like to see what our students are working on, their theses and dissertations have been or will be published here: https://digitalcommons.library.tmc.edu/utgsbs_dissertations/

While the Graduate School relaxed some of its rules in order to accommodate the pandemic restrictions, the rigor and significance of our students' work was not impaired at all by the pandemic. All of our graduates have gone on to medical physics jobs, residencies or post-doctoral research fellowships.

One of the benefits of the pandemic was the conducting of the defenses in a virtual format. The attendance at the public defense seminars has increased by an order of magnitude. Some defenses had over 100 in the audience from all over the world.

Continued on page 2

PROGRAM MANAGEMENT

Anne Baronitis retired as our Program Manager at the end of October, 2020. Dr. Kari Brewer Savannah served as the interim Program Manager until Jeannette McGee joined us as Program Manager in March, 2021. Anne is known to many alumni for her work in admissions at the GSBS over a number of years. As our Program Manager, she introduced innovations such as enhancing alumni activities to the program. When the pandemic shutdown hit, she was tireless in her work with the students to enhance their well-being. Kari is an alumna of the GSBS who is familiar with many of the administrative systems on which graduate education depends. Not only did she establish a quick rapport with our students, but she kept the program in a good place administratively. Jeannette has many years of experience in the administration of graduate education as the liaison between MD Anderson and the GSBS. She, too, has quickly connected with the students.

The unsung heroine of the pandemic is Frances Quintana, who as our Program Coordinator has been the bedrock of the program administration. She handled the logistics of virtual class meetings and the virtual defenses as well as numerous less visible but no less essential tasks. Frances did much of the work on this newsletter, from collecting articles to its layout and production.

I thank all four, without whom we could not have made it through this year.

CURRICULUM REVISION

The program substantially revised its curriculum back in 2017. After a few years' experience, we have refined the curriculum further. A new imaging course will consolidate the non-ionizing imaging modalities, primarily magnetic resonance imaging and ultrasound. A new therapy course will cover the more sophisticated treatment methods for which there is not enough time in the fundamental therapy course. The 2017 revision went too far in replacing the clinical rotation courses with the first-semester introduction to clinical medical physics, which turned out to be too early in our students' experience and has been eliminated. The rotation courses will be revived as electives in which a student can arrange with a faculty member either to take a survey or to explore a clinical topic of specific interest in depth after having taken the introductory medical physics courses. The scheduling of these classes will better balance the number of hours per semester in order to bring them more in line with the course load in other GSBS programs.

IN CLOSING

Our alumni and friends help the program in many ways. Certainly, support of the Shalek Fellowships is crucial to our success. A number of our applicants this year came to us through the referrals of alumni. Several alumni have offered their practical wisdom through seminars with the students, thereby giving them a vision of the profession in practice. Some have simply sent a kind word of encouragement and well wishes during these challenging times.

To all, thank you.

Bud Wendt

Richard E. Wendt III, Ph.D.
Program Director

Please Donate to the Shalek Fellowship Fund

All gifts to the Robert J. Shalek Fellowship Fund will be used specifically for the support of the medical physics educational programs, and will support current fellowships.

To donate online go to **gifts.mdanderson.org.** Choose a gift amount. Check the box "I'd like to choose where my donation will go", from the menu, choose other and enter Robert J. Shalek Fellowship (this annotation is essential to ensuring that your gift is directed as you intend).

To donate by check, mail donations/pledges to:

Shalek Fellowships
Department of Imaging Physics
Attn: Jeannette McGee, Program Manager
1515 Holcombe Blvd., Unit 1472
Houston, TX 77030

THE UNIVERSITY OF TEXAS MD Anderson ~~Cancer~~ Center | UTHealth The University of Texas Health Science Center at Houston
Graduate School of Biomedical Sciences

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The 2020-2021 Medical Physics Alumni Newsletter is published by the Graduate Program in Medical Physics of The University of Texas MD Anderson Cancer Center UTHealth Graduate School of Biomedical Sciences.

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 Feedback from alumni is always welcomed by the Program. Please send your suggestions or comments to medicalphysicsprogram@mdanderson.org.

Program Website: https://gsbs.uth.edu/medphys/.

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FAREWELL TO ANNE BARONITIS

Anne Baronitis, MEd, retired at the end of October, 2020 after a long and distinguished career in the support of graduate education. Many of our alumni remember her as the Director of Admissions at the GSBS around the turn of the century. She since held administrative positions at the UT School of Public Health and the University of Houston Downtown before joining the Medical Physics Program as our Program Manager in June, 2018. In addition to the myriad of administrative details that the Program Manager attends to, Anne took a particular interest in the well-being of our students. She hosted a dinner reception for the new students at her home each August. After the pandemic hit, she facilitated a drive-by welcome to the entering students of 2020. She had numerous virtual meetings with the students as a group and sought out students individually to ensure that they were doing well. She worked with several of our alumni to engage them more in the work of the program. The highlight of this heightened engagement was two virtual seminars in which alumni of the program shared their professional experiences with our students. The program thanks her for her dedication and devotion to our students and alumni and wishes her a delightful, well-earned retirement.

OUR NEW PROGRAM MANAGER, JEANNETTE MCGEE

As the Manager of our Educational Programs, **Jeanette McGee** brings with her 15 years of MD Anderson experience, ten of which were with Trainee & Alumni Affairs and the Trainee Office of the Graduate School of Biomedical Sciences, where she served for three years as a Senior Academic Coordinator for the Office of Research Trainee Programs. Most recently Jeanette served as the Education Program Coordinator in the Department of Translational Molecular Pathology where she added T32 grant program and financial management to her list of skills and experience, working with PIs over the past two years to assure compliance with funding agency guidelines. We are excited to be working with Jeannette.

Jeannette McGee | 713-563-2548
jmcgee@mdanderson.org

THANK YOU TO OUR INTERIM PROGRAM MANAGER, DR. KARI BREWER SAVANNAH

The Education Program thanks Kari Brewer Savannah, Ph.D., who served as the interim Program Manager from October 2020 to March 2021 during a period of transition.

Kari’s continued support of the education program with her knowledge and leadership are invaluable to us.

With our new leaders, and with the continued dedication of the faculty, staff, and administrators, the future of our program is bright.

Program Highlights

The Medical Physics Program kicked off the 2020-2021 academic year with a drive-through welcome to the incoming first year graduate students. Current students carried handmade welcome signs and handed out goody bags at the entrance of Pickens Tower giving the incoming students a chance to interact with everyone safely.

Top row, L/R: Constance Owens, Paige Taylor, Suman Shrestha, and Aashish Gupta, Second row L/R: Hana Baroudi, David Martinus, Benjamin Insley, Hayden Scott, Rebecca DiTusa, Joseph DeCunha, Anne Baronitis, Ben Musall, and Trevor Mitcham.

Suman Shrestha, a PhD student holds a handmade welcome sign.

First Year Masters student, Hayden Scott with second year Masters student, Rebecca DiTusa.

The care packages put together by program manager, Anne Baronitis included sweet and savory snacks, cookies, a notebook, and program giveaways such as a backpack light, pen, and a luggage tag.

Program Highlights

Student Successes

Peer-Reviewed Manuscripts:
Total = 53
Published = 32 (15 first-author and 17 co-author)
Under Review = 21 (10 first-author and 11 co-author)

Abstracts
AAPM 2021
21 oral presentations (8 first-author and 13 co-author)
23 poster presentations (11 first-author and 12 co-author)

All Other Conferences
7 oral presentations (5 first-author and 2 co-author)
9 poster presentations (5 first-author and 4 co-author)

Total amount of student awards
$194,600

First-Year Student Liaison Virtual Events

Midterms semester 1 peer mentor virtual lunch check in and games -- The Peer Mentorship program held virtual events to mimic "mentorship luncheons" we would have once a month in ACB to check in on first years' progress and experience in the program. Played Jackbox games.

Finals semester 1 peer mentor virtual lunch check in -- see above

How to create virtual first year office on Teams with Eva Kelly of Imaging Physics -- The first-year office on the 14th floor is one of the most important rooms of our graduate education. In the absence of this resource, we taught the first-year class how to set up a virtual environment that mimics the first-year office via Microsoft Teams with Eva Kelly.

Mentor-mentee spring social (games) with other physics students -- The first-year liaison set up a social hour on Friday afternoon with physics students from the University of Michigan and Stony Brook University to have cross-program networking opportunities.

Review for exams (imaging physics, MP2) -- Evan Gates led review sessions for first-year exams.

How to write an abstract for AAPM -- Workshop for first-years on how to structure their first submission to AAPM Annual Meeting 2021.

2020-2021 GRADUATES

Trevor Mitcham, Ph.D.
Advisor: Richard R. Bouchard, Ph.D.
Imaging Physics Postdoctoral Fellow
UT MD Anderson Cancer Center

Tucker Netherton, Ph.D.
Advisor: Laurence E. Court, Ph.D.
Radiation Physics Assistant Professor
UT MD Anderson Cancer Center

Cayla A. Zandbergen, Ph.D.
Advisor: Richard R. Bouchard, Ph.D.
UT MD Anderson Cancer Center
Imaging Physics Hybrid Residency

Brian Anderson, Ph.D.
Advisor: Kristy K. Brock, Ph.D.
UC San Diego School of Medicine - Therapy Physics Residency Program

Evan Gates, Ph.D.
Advisor: David T. Fuentes, Ph.D.
University of Washington
Therapy Physics Residency

Benjamin Musall Ph.D.
Advisor: Jingfei Ma, Ph.D.
UTHealth McGovern Medical School - Diagnostic Imaging Physics Residency

Dong Joo Rhee, Ph.D.
Advisor: Laurence E. Court, Ph.D.
UT MD Anderson Cancer Center
Radiation Physics Residency

Aashish C. Gupta, M.S.
Advisor: Rebecca Howell, Ph.D.
MD Anderson Cancer Center
UTHealth Graduate School of Biomedical Sciences, PhD Program

A Message from the 2020-21 Student-Faculty Liaisons Constance Owens and Emily Thompson

The 2020-2021 academic year has been unlike any other due to the COVID-19 pandemic. While the Medical Physics Student Council was confined to planning only virtual events, we did not let this discourage us from planning many educational and social events.

Social Events

To welcome the first-years, we organized a Welcome to Graduate School Drive-Thru event where current students showed up with welcome signs and passed out goody bags (filled with some essential grad school supplies such as a lab notebook, highlighters, snacks, etc.) to the incoming students. We also planned several Virtual Socials via Zoom to facilitate and encourage interactions among students. While we were aware of Zoom fatigue, to make the virtual socials more fun and interactive, our Social Chair, Ben Musall, organized a Social Participation Point Competition where students were awarded points based on attendance and participation in virtual games. The winners of this competition were:

1st Place – Fre'Etta Brooks (hammock)
2nd Place – Benjamin Lopez (ring light)
3rd Place – Trevor Mitcham (tortilla blanket)

Educational Events

Many of the educational events that we planned were based on student feedback. We hosted a Ph.D. Candidacy Process Panel Discussion where Constance Owens gave a 30 minute presentation on the Ph.D. candidacy process and post-candidacy students Brian Anderson, Brigid McDonald, Benjamin Musall, and Benjamin Lopez served on the discussion panel to answer questions about the candidacy exam process. Evan Gates and Constance Owens also organized weekly ABR and candidacy preparation sessions during the 2020 Fall Semester. At these sessions, all participating students would volunteer to create 3 to 5 questions on the session's topic and would be responsible for teaching content related to the questions. The goals of these sessions were to encourage students to start preparing early for ABR Part I and candidacy exams as well as to work together with their classmates. Additionally, throughout the year, our Education Chair, Evan Gates, set up and led several mock candidacy sessions for students who took the candidacy exam this academic year.

Events for First-Years

A couple of years ago, we brought back the position of First-Year Liaison (previously called First-Year Representative). Reinstating this position has allowed more students to get involved in the Medical Physics Student Council and has led to a focus on planning events that help first-years have a smoother transition to graduate school. Our First-Year Liaison, Barbara Marquez, organized several events that were geared towards the needs of first-years. She continued the Peer Mentorship Program which pairs first-years with a current student and hosted several virtual check-in sessions with the mentorship pairs. She also hosted as-needed sessions on topics that first-years requested such as a session on How to Write an Abstract for AAPM.

We, Constance Owens and Emily Thompson, would like to express our sincerest gratitude to the whole student body for being patient with the Medical Physics Student Council as we learned how to navigate through new challenges brought on by the COVID-19 pandemic. We would also like to thank Dr. Wendt, Frances, Anne and Dr. Brewer Savannah for their time and support; they are the backbone of the student council, making sure that we have everything we need to run events and support the student body. And lastly, congratulations to the newly elected members of the Medical Physics Student Council. We pass the torch on to you all and wish you all the best of luck in your future endeavors as student council members!

Sincerely,
Constance Owens and Emily Thompson
(Co student-faculty liaisons)

The Graduate Program in Medical Physics

2021-2022 STUDENT COUNCIL

Barbara Marquez
Student-Faculty Liaison

Soleil Hernandez
Education Representative

Hayden Scott
Social Chair

Benjamin Insley
First Year Student Liaison

A special thank you to the **2020-2021 Student Council** for going the extra mile to ensure that the first year graduate students felt welcomed as they learned how to navigate through new challenges brought on by the COVID-19 pandemic.

Constance Owens & Emily Thompson
Co Student-Faculty Liaisons

Evan Gates
Education Representative

Benjamin Musall
Social Chair

Barbara Marquez
First Year Student Liaison

Meeting the Incoming Class of 2021

Medical Physics Admissions
By the Numbers

81 Applications received

19 Applicants interviewed

19 Interviews conducted through Zoom

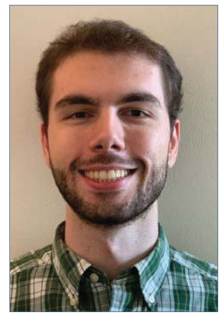
9 Matriculating

15 Offers made

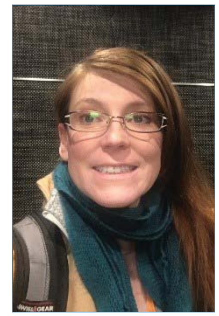
Average Scores of
Matriculating Students

UNDERGRADUATE GPA	3.61
GRADUATE GPA	3.86
VERBAL GRE	158
QUANTITATIVE GRE	156
ANALYTICAL GRE	4.44

Xinru Chen
Duke Kunshan University
PhD Program



Skylar Gay
Houston Baptist University
PhD Program

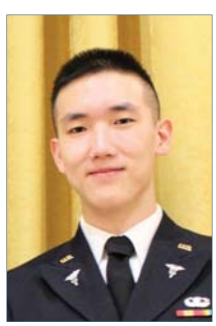


Rachel Glenn
University of Utah
SMS Program

Madison Grayson
Arizona State University
PhD Program

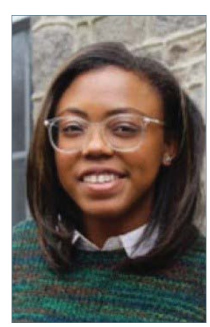
Aashish Gupta
MD Anderson Cancer Center UTHealth Graduate School of Biomedical Sciences
PhD Program

Collin Harlan
Texas A&M University
PhD Program



Kevin Liu
Columbia University
PhD Program

Jian Ming Teo
National University of Singapore
PhD Program



Erin Snoddy
Swarthmore College
PhD Program

STUDENT AWARDS

AMERICAN LEGION AUXILIARY FELLOWSHIP
Mary Gronberg | Advisor: Laurence E. Court, Ph.D.
Emily Thompson | Advisor: Erik Cressman, M.D., Ph.D.

CENTER FOR CLINICAL AND TRANSLATIONAL SCIENCES TL1 PREDOCTORAL FELLOWSHIP
Mary Gronberg | Advisor: Laurence E. Court, Ph.D.

LARRY DEAVEN PH.D. FELLOWSHIP IN BIOMEDICAL SCIENCES
Tucker Netherton | Advisor: Laurence E. Court, Ph.D.

ELLEN TAYLOR GOLDIN LEGACY SCHOLARSHIP
Sharbacha Edward | Advisor: Stephen F. Kry, Ph.D.

DR. JOHN J. KOPCHICK FELLOWSHIP
Brian Anderson | Advisor: Kristy K. Brock, Ph.D.
Yasaman Barekatain | Advisor: Raghu Kalluri, M.D., Ph.D.
Mary Gronberg | Advisor: Laurence E. Court, Ph.D.
Brigid McDonald | Advisor: Clifton Fuller, M.D., Ph.D.

CHARLENE KOPCHICK FELLOWSHIP
Soleil Hernandez | Advisor: Laurence E. Court, Ph.D.

ROBERT S. LANDAUER FELLOWSHIP FROM THE HEALTH PHYSICS SOCIETY
Suman Shrestha | Advisor: Rebecca M. Howell, Ph.D.

THE SCHISSLER FOUNDATION FELLOWSHIP
Yasaman Barekatain | Advisor: Raghu Kalluri, M.D., Ph.D.

ANDREW SOWELL-WADE HUGGINS FELLOWSHIP/ PROFESSORSHIP
Yao Zhao | Advisor: Jinzhong Yang, Ph.D.

Soleil Hernandez | Advisor: Laurence E. Court, Ph.D.
- Matthew Mireless Scholarship-UTHealth Student Inter-council

Benjamin Insley | Advisor: Rebecca M. Howell, Ph.D.
- Virtual Travel Award, Particle Therapy Co-operative Group Virtual

Barbara Marquez | Advisor: Laurence E. Court, Ph.D.
- GSBS Elevator Speech Competition - 2nd Place and People's Choice

Brigid McDonald | Advisor: C. Dave Fuller, M.D., Ph.D.
- Best Poster Award at Winter Institute of Medical Physics
- ISMRM Research Exchange Grant
- Winter Institute of Medical Physics Early Career Scholarship

Suman Shrestha | Advisor: Rebecca M. Howell, Ph.D.
- ACR Medical Physics Graduate Scholarship
- Health Physics Society Travel Grant
- Radiation Physics Publication of the Month
- SW-AAPM Young Investigator Symposium - 2nd Place Oral
- SW-AAPM Winner of Med Phys Slam Oral Competition

Emily Thompson | Advisor: Erik Cressman, M.D., Ph.D.
- SIR Allied Scientist Grant
- CPRIT Graduate Research Scholar Award
- Waltrip Imperial Guard Alumnae Scholarship
- SW-AAPM Young Investigator Symposium - 2nd Place Oral
- Federation of Houston Professional Women Scholarship
- PTCOG Travel Fellowship

2021 COMMENCEMENT

Evan Gates, PhD

Tucker Netherton, PhD


Joshua Gray, PhD


Brian Anderson, PhD


Peter Pisters, MD, President
UT MD Anderson Cancer Center

Speaker: J.J. Watt, formerly a star player of the Houston Texans

ELEVATOR SPEECH COMPETITION

Due to the COVID-19 Pandemic, the GSBS Student Research Day was not held in its usual format. Instead, the GSBS hosted a virtual elevator speech competition. Each competitor gave a 90-second elevator speech. A panel of judges selected the winners and the audience determined the winner of the People's Choice Award. Prizes included 1st-place: $1,000; 2nd-place: $500; 1st-year student bonus: $300; People's Choice Award $300.

Three Medical Physics students participated, and their speeches follow.

Benjamin Insley
Advisor: Mohammad Salehpour, Ph.D.

Coming into therapeutic medical physics, I assumed all new procedures went through mouse trials first. For the most part, I was right. But when I was wrong, there were deadly consequences. Look up the phase 3 RTOG 0617 study. Clinicians wanted to escalate radiation dose for lung cancer patients, but completely skipped the preclinical mouse model process and immediately ran human trials. They increased the dose by less than a Gray per fraction, and yet the trial had to be cut short because the fatality rate of the treatment more than doubled.

They ran retrospective mouse trials and discovered all the red flags that could have prevented these deaths.

The RRP later mandated mouse trials prior to human experimentation – but let's look at the current state of radiation therapy. Stereotactic radiosurgery, FLASH therapy, heavy ion therapy. Man's reach is beginning to exceed his grasp. Do we even have the technology to perform comparable mouse experiments?

Well in Dr. Mohammad Salehpour's lab we're using converging beam geometry and a cutting-edge, low-energy x-ray source to create a variable-dose rate, variable-precision small animal irradiator capable of reproducing the most complex treatment plans in mouse models. My name is Ben Insley and I am working to push the limits of radiation delivery in preclinical trials because if we're going to cure cancer, we're going to cure cancer in mice first.

ELEVATOR SPEECH COMPETITION

Barbara Marquez

Advisor: Laurence E. Court, Ph.D.

2nd Place and People's Choice Winner

Our cancer patients deserve the best treatment possible. That's why in radiotherapy we perform a service called quality assurance, where we check the way physicians draw contours (or tumor shapes) on diagnostic scans, important pictures that show us where the tumor is...

The better they draw "inside the lines" of cancer's borders, the better the radiation is at hitting the tumor and not the healthy tissue. But what if I told you... That even the best physicians are limited by how well they can draw this tumor, due to the little things they can't see with the naked eye.

And that beyond the walls of our fortunate hospital, there are other clinics severely limited in their resources to do this job. Well, the good news is that a computer can see an imaging scan as more than just a picture.

Express the picture as millions of little numbers, or little squares with values that tell us about the tissue inside. I have trained such a computer to draw patterns, analyze statistics, calculate shapes and features over the cancerous tumor....

Farther than the human eye can see. I'm optimizing the computer's analysis to make a prediction, of the best way to "draw inside the lines" of the tumor with radiation and show the physician a second opinion. The computer I train becomes a teaching tool for clinical teams, another doctor at the table if you will ... much like a GSBS trainee learns from another colleague in their lab.

I'm Barbara, and with the help of artificial intelligence, I'm creating a system that can help even the best physicians color inside the lines of disease to treat cancer

So that we can deliver, to our cancer patients, the best treatment possible!

ELEVATOR SPEECH COMPETITION

Cenji Yu
Advisor: Laurence E. Court, Ph.D.

What does it take for human beings to survive?

If you ask the doctors, they will say you need at least these five organs: Heart, lung, kidney, liver and spleen.

For abdominal radiation treatment, three out of five vital organs are directly in the radiation field.

So what do we usually do to protect them? Doodling. Yep, you heard it right. Our physicians scroll through each slice of CT scan and use their trained eyes, to draw a shield around these organs with manual, repetitive doodling. All they have between patient's most vital organs to survive and radiation, is a digital paint brush, from Microsoft paint.

Hi my name is Cenji. I am a 3rd year PhD student from Court lab. My project focuses on capturing all major abdominal organs, not with a paintbrush, but with something a bit more sophisticated.

With the help of deep learning, we develop models that adapt and morph itself to best suit the organ it is trained to delineate, just as organs do in the abdomen. Stomach, small bowel, colon, spleen, kidney, even duodenum, you name it, we have it all covered.

Our recent results showed that over 90% of our predicted contours are deemed acceptable for our clinicians after minor edits.

Our work aims to liberate physicians from their archaic paintbrush and doodling. So that patients are protected with cutting edge tools driven by deep learning.

Our goal is to help live, not just survive.

Trevor Mitcham, Ph.D.

Development of Quantitative Ultrasound-Mediated Molecular Imaging of the Tumor Microenvironment

While conventional diagnostic imaging modalities provide anatomical information to clinicians, these techniques are not sensitive to critical physiological processes. In order to properly classify cancer, it is necessary to investigate noninvasive methods which can provide insight into these processes, allowing clinicians to determine personalized therapeutic options. Therefore, molecular imaging is focused on visualization and characterization of biomarkers within the tumor microenvironment (TME), which can then be combined with the anatomical information provided from diagnostic imaging.

Two such biomarkers of interest are blood oxygen saturation (SO2) and cell receptor expression. SO2 is a measure of the fraction of hemoglobin which is bound to oxygen, which has been shown to correlate to tumor progression. Additionally, several cancer subtypes have been shown to overexpress specific cell receptors (e.g., EGFR). Therefore, cell receptor expression has emerged as a biomarker which can help the physician to identify potential beneficial treatment options. While molecular imaging methods are being explored in order to assess these two biomarkers, current methods suffer from limitations such as poor spatio-temporal resolution and poor depth penetration. To overcome these limitations, ultrasound (US)-mediated imaging techniques have been investigated to characterize these molecular imaging biomarkers.

The objective of this work is to develop and validate US-mediated techniques to investigate the TME biomarkers of SO2 and cell receptor expression. In this work, photoacoustic (PA) imaging methods were developed along with optical fluence modeling techniques in order to improve accuracy and precision of SO2 estimates. SO2 estimation accuracy was shown to improve from 16.8% error to 3.2% error with a precision of 2.3% in tissue-mimicking phantoms, while in vivo estimation of SO2 in a rat artery (i.e., expected value >95%) increased from 92.9±2.9% to 95.5±1.2%.

Additionally, a high-frequency US-mediated imaging platform was developed to image and activate phase-changing perfluorocarbon nanodroplet contrast agents (PNCAs). Using this imaging platform, PNCAs were activated and imaged to determine PNCA enhancement. Optimal PNCA particles generated a median signal enhancement of 6.2 in a phantom environment after US activation, while a pilot in vivo study showed significant US-mediated PNCA activation of two separate intra-muscular injections in the hind limb.

Advisory Committee:
Richard R. Bouchard, Ph.D., Chair
David T. A. Fuentes, Ph.D.
Christine B. Peterson, Ph.D.
Konstantin V. Sokolov, Ph.D.
R. Jason Stafford, Ph.D.

Dr. Mitcham graduated in the summer and is continuing his work with the Department of Imaging Physics as a Postdoctoral Fellow.

Cayla Zandbergen, Ph.D.

Development of Quantitative Molecular Photoacoustic Imaging for Noninvasive Cancer Diagnostics

Traditional diagnostic imaging provides clinicians with anatomical information that guides both diagnosis and treatment planning; however, once a tumor has progressed enough to be visible, it has often reached an advanced stage. Molecular imaging techniques allow for real-time visualization of chemical and biological processes via imaging of specific biomarkers, which can facilitate detection of malignancies before they become visible. One biomarker of interest is blood oxygen saturation (SO2) due to its correlation with hypoxia, which is associated with increased tumor malignancy; some studies have also established SO2 as an independent biomarker of disease progression. Additionally, because cancerous cells commonly overexpress specific antigens (e.g., folate receptor alpha [FRα] in ovarian cancer), cell receptor expression is an emerging biomarker that can be leveraged to localize malignant cells and guide patient-specific treatment strategies. Molecular imaging strategies are being explored to assess these biomarkers; however, each suffers from inherent limitations, such as poor spatiotemporal resolution, poor depth penetration, or high regulation from the use of ionizing radiation.

To overcome these challenges, photoacoustic (PA) imaging is being investigated due to its ability to resolve optical contrast at clinically relevant depths with high spatiotemporal resolution. In this work, multi-wavelength PA imaging techniques were developed for noninvasive, quantitative visualization of two biomarkers: SO2, via imaging of oxy- and deoxyhemoglobin; and cell receptor expression, via imaging of a novel contrast agent, liposome-encapsulated J-aggregated indocyanine green (Lipo-JICG), which is conjugated with anti-FRα antibodies for specific targeting to the FRα receptor on ovarian cancer cells. SO2 was shown as a biomarker in disease progression of acute lymphblastic leukemia, with significantly more change in SO2 (relative to individual baseline) in diseased than in control mice. Lipo-JICG was first characterized in phantom environments, demonstrating its ability for simultaneous imaging and unmixing with endogenous hemoglobin (allowing for more straightforward in vivo imaging) and its fluence and photothermal stability during PA imaging. Specificity of Lipo-JICG targeting was also shown in vitro, with more signal from SKOV3 cells (i.e., high FRα expression), as well as in vivo, with increased Lipo-JICG contrast enhancement observed from targeted FRα-Lipo-JICG than non-targeted RG-16-Lipo-JICG in mice with SKOV3 ovarian tumors.

Advisory Committee:
Richard R. Bouchard, Ph.D., Chair
Seth T. Gammon, Ph.D.
Marina Konopleva, M.D., Ph.D.
Jingfei Ma, Ph.D.
Marites Melancon, Ph.D.
Christine B. Peterson, Ph.D.

Dr. Zandbergen graduated in the summer and is continuing her work with the Department of Imaging Physics as a Hybrid Residency Fellow.

Brian Anderson, Ph.D.

Improving Treatment of Local Liver Ablation Therapy with Deep Learning and Biomechanical Modeling

In the United States, colorectal cancer is the third most diagnosed cancer, and 60-70% of patients will develop colorectal liver metastasis. While surgical resection is the standard of care for curative intent, it is only available in ~20% of patients. For patients who are not surgical candidates, local percutaneous ablation therapy (PTA) has been shown to have similar 5-year overall survival rates. PTA can be a challenging procedure, largely due to spatial uncertainties in the localization of the ablation probe, and in measuring the delivered ablation margin.

For this work, we hypothesized that biomechanical modeling could be used to reduce spatial uncertainties inherent to PTA. Furthermore, that deep learning could create segmentations qualitatively preferred to manual contours of the liver and liver structures in a rapid time, and predict local progression based on intra-procedural imaging. Firstly, our study with biomechanical modeling to reduce spatial uncertainties and measure minimum distance to agreement found a significant difference ($p<0.01$) in delivered minimum ablation margin between progressing (n=14) and progression-free (n=16) patients. Secondly, automating the segmentation of the normal liver in contrast and non-contrast enhanced CT to alleviate temporal bottlenecks in the creation of the biomechanical modeling; Blinded qualitative assessment of the segmentation by three physicians found the automated contours to be preferred in 60% (30/50) of cases, and are created in < 30 seconds. Thirdly, in segmentation of the disease and ablation zone to reduce segmentation variability, qualitative evaluation by two radiologists and a radiology-trained physician fellow found 100%(n=24) of disease segmentations and 84% (16/19) of ablation zone segmentations had a Likert score of 4 out of 5. Lastly, our outcome prediction model, where we attempt to identify regions of import to the ablation procedure, reported an area under the curve value of 0.81. The model also provides visualizations via integrated gradients to help provide human interpretable explanations for model decisions.

Our work resulted in the validation of biomechanical modeling in ablation assessment, creation of automatic segmentation models for the liver, disease, and ablation volume within our treatment planning system, and an outcome prediction model. The liver model has been used to segment over 1,800 exams in our clinic since 3/23/2021, and our outcome prediction model provides visual interpretations of model decisions. The culmination of this work has enabled our on-going Phase 2 Clinical Trial (NCT04083378). Future studies will improve upon auto segmentation models, and further investigate outcome prediction modeling.

Advisory Committee:
Kristy K. Brock, Ph.D., Chair
Carlos E. Cardenas, Ph.D.
Laurence E. Court, Ph.D.
Erik N. K. Cressman, Ph.D., M.D.
Ankit B. Patel, Ph.D.
Richard E. Wendt III, Ph.D.

Dr. Anderson graduated in the summer and will begin his residency at the University of California.

Evan Gates, Ph.D.

Imaging Based Prediction of Pathology in Adult Diffuse Glioma with Applications to Therapy and Prognosis

The overall aggressiveness of a glioma is measured by histologic and molecular analysis of tissue samples. However, the well-known spatial heterogeneity in gliomas limits the ability for clinicians to use that information to make spatially specific treatment deci-sions. Magnetic resonance imaging (MRI) visualizes and assesses the tumor. But, the exact degree to which MRI correlates with the actual underlying tissue characteristics is not known.

In this work, we derive quantitative relationships between imaging and underlying pathology. These relations increase the value of MRI by allowing it to be a better surrogate for underlying pathology and they allow evaluation of the underlying biolog-ical heterogeneity via imaging. This provides an approach to answer questions about how tissue heterogeneity can affect prognosis.

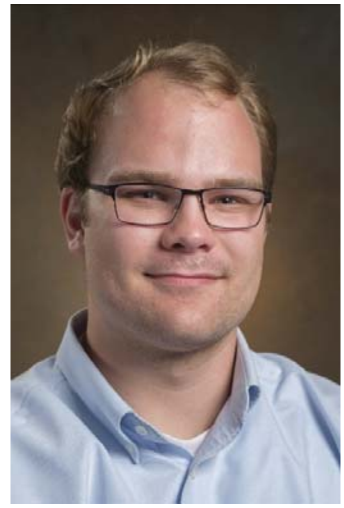
We estimated the local pathology within tumors using imaging data and stereotactically precise biopsy samples from an ongoing clinical imaging trial. From this data, we trained a random forest model to reliably predict tumor grade, proliferation, cellularity, and vascularity, representing tumor aggressiveness. We then made voxel-wise predictions to map the tumor heterogeneity and identify high-grade malignancy disease.

Next, we used the previously trained models on a cohort of 1,850 glioma patients who previously underwent surgical resection. High contrast enhancement, proliferation, vas-cularity, and cellularity were associated with worse prognosis even after controlling for clinical factors. Patients that had substantial reduction in cellularity between preoper-ative and postoperative imaging (i.e. due to resection) also showed improved survival.

We developed a clinically implementable model for predicting pathology and prognosis after surgery based on imaging. Results from imaging pathology correlations enhance our understanding of disease extent within glioma patients and the relationship between residual estimated pathology and outcome helps refine our knowledge of the interaction of tumor heterogeneity and prognosis.

Advisory Committee:
David Fuentes, Ph.D., Chair
Dawid Schellingerhout, M.D.
Kristy K. Brock, Ph.D.
John D. Hazle, Ph.D.
Jason Huse, M.D., Ph.D.

Dr. Gates graduated in the summer and will begin a residency July 2021 at the University of Washington.



Benjamin Musall, Ph.D.

Quantitative Magnetic Resonance Imaging for Prediction of Treatment Response in Triple Negative Breast Cancer

Triple Negative Breast Cancer (TNBC) is an aggressive subtype of breast cancer which lacks upregulated hormone receptors. Because of this, it is not vulnerable to clinically available targeted therapies. When treated with standard of care neoadjuvant systemic therapy (NAST), TNBC only shows approximately a 40% rate of pathologic complete response (pCR). A biomarker which could predict TNBC response to NAST early during treatment would be useful, as it would allow for non-responders to be triaged to alternative therapies and potentially allow for the treatment of responders to be de-escalated.

Quantitative Magnetic Resonance Imaging (MRI) may be used to probe and measure aspects of the perfusion, diffusion, and mechanical properties of a cancer and its surroundings. In the research setting, several quantitative MRI biomarkers have shown potential early prediction of response in breast cancer. However, TNBC shows a unique image phenotype on both conventional MRI and MRI biomarkers of response. This, in combination with the clinical needs of TNBC, warrants the development of MRI biomarkers of response that are specific to TNBC. This rational supports a large, ongoing prospective trial of TNBC patients at our institution who underwent longitudinal multiparametric MRI at pretreatment, after 2 cycles of NAST and after 4 cycles of NAST. In this dissertation, MRI biomarkers from diffusion MRI, dynamic contrast-enhanced (DCE) MRI, and magnetic resonance elastography (MRE) were developed and applied as predictors of NAST response in the prospective trial cohort.

First, aspects of the tumor necrosis on pretreatment diffusion MRI and DCE MRI were investigated as potential predictors of response. Our study established that no associations were present between tumor necrosis and the treatment response in our study population, thus served as a caution in the field for physicians considering necrosis on MRI as a possible negative predictive biomarker.

Second, functional tumor volume (FTV), an existing biomarker of response in breast cancer based on DCE MRI contrast thresholds, was optimized for early prediction of NAST response in TNBC. Fast DCE MRI from pretreatment and cycle 4 MRI scans was leveraged to find an optimal contrast timing to improve the predictive performance of FTV. FTV contrast thresholds optimized over the TNBC cohort paralleled TNBC subtype analysis presented by other groups in previous reports. This external validation further supports the use of a TNBC-specific FTV tuning for prediction of NAST response.

Third, diffusion MRI measurements in the peritumoral region were developed and applied as predictors of NAST response. We found that maximum diffusion and the standard deviation of diffusion in peritumoral regions including fatty tissues were useful for prediction of NAST response.

Finally, a convolutional neural network (CNN)-based MRE inversion algorithm was developed for improved spatial resolution of breast cancer MRE. Because acquisition of ground truth MRE data is impossible, simulating MRE data via finite volume methods (FVM) was substituted in CNN training.

The CNN-based inversion algorithm was validated through gel phantom measurements. Validation on in vivo breast MRE was performed by comparing stiffness measurements from different breast tissues between the CNN-based algorithm and the existing vendor algorithm. Both algorithms were able to effectively distinguish between the tumor and other breast tissues, though only the vendor algorithm was able to distinguish between fatty tissue and fibroglandular tissue.

In conclusion, quantitative MRI biomarkers of breast cancer were developed and show promise for early prediction of NAST response in TNBC. MRI biomarkers of necrosis were not seen to be useful, while TNBC-tuned FTV and diffusion MRI of the peritumoral region showed promise for this purpose. A CNN-based inversion algorithm shows potential for MRE with improved spatial resolution, though additional development is required.

Advisory Committee:
Jingfei Ma, Ph.D., Chair
Ken-Pin Hwang, Ph.D.
Steven Lin, Ph.D.
Mark D. Pagel, Ph.D.
Gaiane M. Rauch, M.D., Ph.D.
R. Jason Stafford, Ph.D.

Dr. Musall graduated this summer and will begin a 3-year Hybrid Residency at the UTHealth McGovern Medical School in Diagnostic Imaging Physics.

Tucker Netherton, Ph.D.

A Fully-Automated, Deep Learning-Based Framework for Computed Tomography-Based Localization, Segmentation, Verification, and Treatment Planning of Metastatic Vertebrae

Palliative radiotherapy is an effective treatment for the palliation of symptoms caused by vertebral metastases. Visible evidence of disease must be localized with imaging as part of the treatment planning process. However, due to the emergent nature of the procedure, anatomic variants in the spine, and similarities in adjacent vertebrae, wrong level treatments have been reported to occur. In addition, mistakes in manual contouring of anatomic structures is a major failure mode in radiotherapy treatment planning.

The purpose of this study is to mitigate the challenges associated with treatment planning of the spine by automating the treatment planning process for 3D conformal radiotherapy. To accomplish this, deep and machine learning models will work in symphony within a multi-stage framework to perform image-based tasks that are traditionally manually performed. An automated solution that is efficient, effective, and safe would be especially valuable for clinics seeking to expedite their palliative radiotherapy planning services or optimize their use of diagnostic and simulation CT imaging for radiotherapy treatment planning.

The central hypothesis of this work is that that 90% of automated treatment plans for bony metastases of the spine are clinically acceptable and can be generated in less than 10 minutes. Additionally, that potential mistreatments can be flagged with 100% sensitivity and at least 75% specificity.

Advisory Committee:
Laurence E. Court, Ph.D., Advisory Professor
Peter A. Balter, Ph.D.
Carlos E. Cardenas, Ph.D.
Caroline Chung, Ph.D.
Rebecca M. Howell, Ph.D.
Christine B. Peterson, Ph.D.

Dr. Netherton graduated in the spring and has started an assistant professorship with the Department of Radiation Physics at the University of Texas MD Anderson Cancer Center.

Dong Joo Rhee, Ph.D.

Automation of Radiation Treatment Planning for Cervical Cancer

Cervical cancer is one of the most common cancer in low- and middle-income countries (LMICs). The mortality rate can be reduced if radiation treatment becomes widely available. However, due to the lack of radiation treatment facilities and human resources, many cervical cancer patients in Africa are not able to receive timely treatments or advanced therapies. To increase the availability of radiation treatment in low-and middle-income countries (LMICs) including African countries, many attempts have been made to reduce the cost of medical linear accelerators. However, even if the number of treatment machines increases in these countries, the number of patients receiving radiation treatment would not increase due to a lack of experts who can create clinically acceptable radiation treatment plans. To fill the gap, we automated the entire radiation treatment planning process by automating the contouring, planning, and quality assurance (QA) processes in cervical cancer radiation treatment.

To create a high-quality radiation treatment plan, accurate contours must be generated first. We used convolutional neural networks (CNN), one of the most effective deep learning techniques for image processing, to create an auto-contouring model for 3 CTVs and 12 normal structures for cervical cancer radiation treatment and showed that 93% of the automatically generated contours were clinically acceptable.

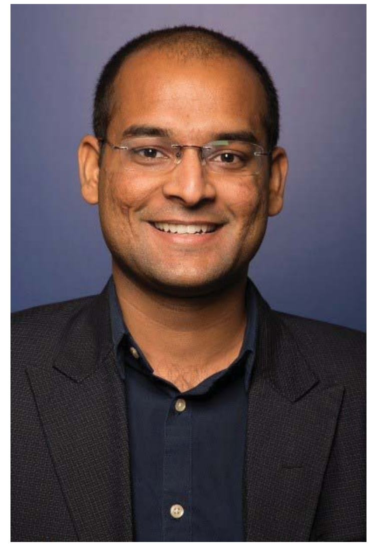
For planning, we automated 3 treatment delivery techniques including 2D 4-field-box, 3D conformal radiation therapy (3D-CRT), and volumetric-modulated arc therapy (VMAT). We also automated the field-in-field (FIF) technique to reduce hotspots in the automatically generated 4-field-box and 3D-CRT plans. Each beam delivery technique was evaluated on 35 retrospective patient data from South Africa, and on average, 95% of the automatically generated plans were clinically acceptable.

As clinically unacceptable plans were mostly caused by inaccurately generated contours, the quality of the contours should be verified to ensure the quality of the plans. To automatically detect clinically unacceptable contours, we developed an automated contour QA method using two independently developed auto-contouring systems. We hypothesized that if one of the two independently developed auto-contouring systems failed, the discrepancy between the two contours would be substantial enough to be identified by measuring the similarity between the two contours. We found that more than 90% of the contouring errors can be detected with an appropriate choice of similarity metrics.

In conclusion, most of the automatically generated contours and plans for cervical cancer radiation treatment were clinically acceptable. Furthermore, errors in the contours can be flagged by the contour QA method. The entire system has been implemented to the Radiation Planning Assistant (RPA), a web-based toolbox for automated planning, to help cervical cancer patients in LMICs.

Advisory Committee:
Laurence E. Court, Ph.D., Chair
Carlos E. Cardenas, Ph.D.
Anuja Jhingran, M.D.
Stephen F. Kry, Ph.D.
Surendra Prajapati, Ph.D.

Dr. Rhee graduated in the summer and started a residency with the Department of Radiation Physics at the University of Texas MD Anderson.



Aashish C. Gupta, M.S.

Advancement of a 3D Computational Phantom and Its Age Scaling Methodologies for Retrospective Dose Reconstruction of Childhood Cancer Survivors Treated with Radiotherapy

We have used a 3D age-scalable computational phantom for over two decades for retrospective dose reconstruction studies of childhood cancer survivors (CCS) treated with 2D historic radiotherapy (RT). However, our phantom and its age scaling functions (ASF) must be updated so that it can be used in studies that include survivors treated with contemporary RT. We aimed to implement our phantom and its age scaling functions in DICOM standard and determine the feasibility of applying our ASFs to accurately scale the whole-body CT-based anatomies.

In the implementation study, we developed Python scripts that model the phantom and ASFs in a treatment planning system (TPS). We validated the implementation by comparing several geometric and anthropometric parameters with reference datasets. We then conducted a dosimetric analysis to determine the accuracy of dose calculation using our phantom. In the feasibility study, we downscaled various computed tomography (CT)-based phantoms from the University of Florida/National Cancer Institute (UF/NCI) phantom library to arbitrary ages. We quantified the geometric accuracy of scaling by comparing several overlaps, distance, and anthropometric parameters of the scaled phantom with reference datasets. We also assessed the dosimetric impact of ASFs by quantifying the difference in dose from standard Wilms' tumor RT plan simulated on exact scaled-age and nearest age-matched phantom while using the same field size and anatomical landmark dependent field size in two different scenarios.

This study showed that phantoms were implemented in DICOM standard within 3% of points/volume of our original phantoms. The heights and dosimetric accuracy were within 7% of ground-truth values. In the feasibility study, overlap metrics showed "good" agreement for most cases except pancreas and kidneys. The maximum displacement of 4.1cm was obtained in the scaled liver. In both implementation and feasibility studies, organ masses were smaller than reference masses in general. A difference of 6% and 1.3 Gy was obtained for percent volume 15Gy (V15) and mean dose, respectively, across two phantom categories when the same field size was used. Both metrics were significantly different ($p<0.05$) for partially in-beam organs when field size varied. Overall, our results show that phantom and ASFs can be accurately used in TPS for modern RT studies, and our ASFs can accurately scale whole-body CT-based anatomy.

Advisory Committee:
Rebecca M. Howell, Ph.D., Advisory Professor
Choonsik Lee, Ph.D.
Stephen F. Kry, Ph.D.
Peter A. Balter, Ph.D.
David S. Followill, Ph.D.
James P. Long, Ph.D.

Mr. Gupta graduated in the summer and will continue his education in the PhD Program in the GSBS Medical Physics Program.

Aaron M. 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 Blanchard'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 that is judged to make a significant contribution to cancer therapy or diagnosis. The recipient of the award is selected by a subcommittee reporting to the Medical Physics Graduate Program's Steering Committee. The award consists of a certificate and monetary award. Additionally, the graduate's name is engraved on the Aaron Blanchard Research Award in Medical Physics plaque that is displayed in the classroom.

1999-2019
AWARD RECIPIENTS

2019 Megan Jacobsen, Ph.D.
2018 Xenia Fave, Ph.D.
2017 Justin Mikell, Ph.D.
2016 Daniel Robertson, Ph.D.
2015 John Eley, Ph.D.
2015 Luke Hunter, M.S.
2014 Christopher Peeler, Ph.D.
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.

2020 RECIPIENT
Drew Mitchell, Ph.D.

Mitchell received this award in recognition of his Ph.D. dissertation:

"Identification of Intracranial Lesions with Dual-Energy Computed Tomography and Magnetic Resonance Phase Imaging"

His research with **David T. A. Fuentes, Ph.D.** focused on introducing and evaluating a quantitative method for selecting parameters that minimize image variability.

RADIATION PHYSICS Residency Program

Incoming Fellows & Residents

Mohammad Salehpour, Ph.D., DABR
Program Director

BENJAMIN LEWIS, PH.D.
Virginia Commonwealth University

ALLISON PALMIERO, PH.D.
University of Kentucky

DONG JOO RHEE, PH.D.
MD Anderson UTHealth Graduate School

RADIATION PHYSICS Advanced Fellows

Mohammad Salehpour, Ph.D., DABR
Program Director

DAVID FLINT, PH.D.
MD Anderson UTHealth Graduate School

TRAVIS SALZILLO, PH.D.
MD Anderson UTHealth Graduate School

RADIATION PHYSICS Residency Program

Mohammad Salehpour, Ph.D., DABR
Program Director

Current Residents

Nitish Chopra, Ph.D.
University of Massachusetts-Lowell

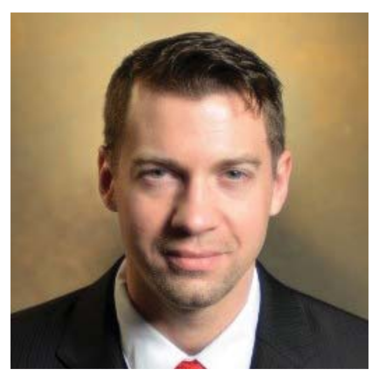
Irwind Tendler, Ph.D.
Dartmouth College

Sara Thrower, Ph.D.
MD Anderson UTHealth Graduate School

Marissa Vaccarelli, M.S.
Hofstra University

Residents Completing Program - August 2021

Fahed Alsanea, Ph.D.
MD Anderson UTHealth Graduate School

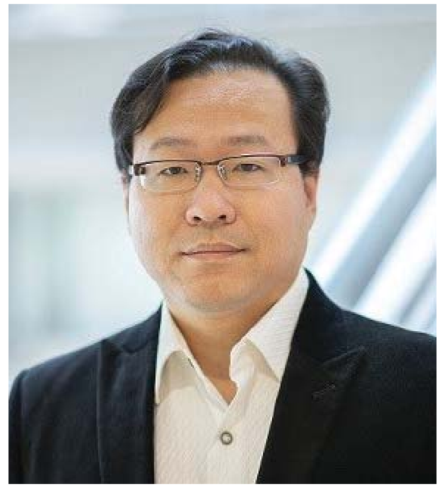


Joshua Niedzielski, Ph.D.
MD Anderson UTHealth Graduate School

IMAGING PHYSICS Residency Program

Incoming Fellows

Ho-Ling Anthony Liu, Ph.D.
Program Director



Peng Sun, Ph.D.
Washington University School of Medicine in St. Louis

Cayla A. W. Zandbergen, Ph.D.
MD Anderson UTHealth Graduate School

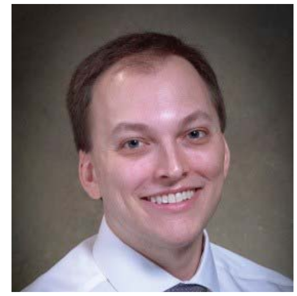
IMAGING PHYSICS Residency Program

Ho-Ling Anthony Liu, Ph.D.
Program Director

Current Fellows

Megan Jacobsen, Ph.D.
MD Anderson UTHealth Graduate School

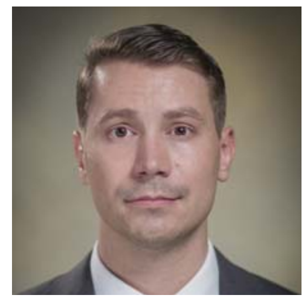
Jorge Jimenez, Ph.D.
University of Wisconsin-Madison



Drew Mitchell, Ph.D.
MD Anderson UTHealth Graduate School

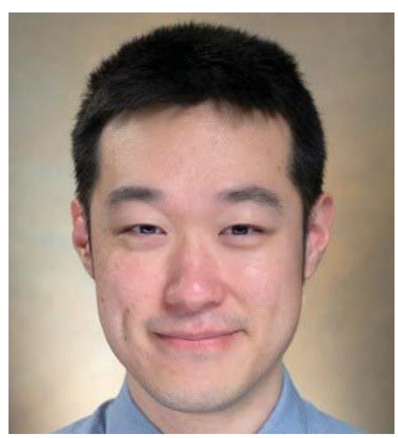
M. Allan Thomas, Ph.D.
University of Arkansas at

Jeremiah Sanders, Ph.D.
MD Anderson UTHealth Graduate School



Keith Michel, Ph.D.
MD Anderson UTHealth Graduate School

Completed Program - March 2021



Henry Chen, PhD
University of British Columbia

SHALEK FELLOWSHIP REPORT

Shalek Fellowship Fund 2020-2021

The alumni, faculty and friends of the Medical Physics Program donated a total of $19,855 to the Shalek Fellowship Fund during the 2020-2021 year. The statistics of these gifts are given in the accompanying table. Our donors' generosity has enabled us to offer our only incoming SMS student this year, Rachel Glenn, a stipend for her first two semesters and tuition and fees for her first year in the program.

Rachel Glenn is pursuing the SMS degree to advance her career in medical physics. She has previous research experience in studying optics in multiple disciplines and within the context of materials, biomedical, and molecules. It began with a B.S. in computer engineering, then a Ph.D. in physics associated with magnetic resonance modalities, and finally postdoctoral research in optical chemistry. Her research has been at the interface of multiple disciplines, where grand challenges, such as controlling chemical reactions, requires collaborations across multiple disciplines. She draws inspiration from Kenneth G. Wilson, who stated "The hardest problems of pure and applied science can only be solved by the open collaboration of the worldwide scientific community." It was during her research in physics and chemistry on developing more realistic models of molecular dynamics with applications to solving problems associated with the diagnosis and treatment of cancer that she decided to pursue a masters in medical physics. During her research in chemistry, she was recruited by industry for her numerical modeling in physics, optics, and quantum dynamics in the area of aerodynamics and artificial intelligence. She has already established a collaboration with Dr. Dave Fuller that would bring her broad experience to bear on problems in radiotherapy using machine learning, graphical models, statistical, and computational methodology for personalized treatment decisions over time resulting in real-time adaptive planning procedures.

Of the last five years' Shalek Fellowship recipients, three have gone on to earn their PhDs in Medical Physics, three more are enrolled in Ph.D. programs in Medical Physics or Bioengineering, and two went from the SMS to a medical physics residency. The donations to the Shalek Fellowship Fund thus have a direct and positive impact upon the students who receive them and thence upon the field of medical physics.

The Medical Physics Program thanks the donors to the Shalek Fellowship Fund. All gifts, both large and small, both single and recurring, help the program in its work. Several years ago, we changed from a biannual to an annual appeal so that our request would be more predictable. Please consider giving generously in response to the upcoming appeal in the fall of 2021.

Bud Wendt
Program Director

Shalek Donations in 2020-2021

Total Given		$19,855
Smallest Gift		$80
Largest Gift		$5,025
Mean of the Gifts		$735
Median and Mode of the Gifts		$500
Donors		25
	PhD Alumni	7
	MS Alumni	6
	Faculty	10
	Former Faculty	1
	Other Friends	1

Robert J. Shalek
Fellowship Fund

The Robert J. Shalek Fellowship is used specifically for the support of the Medical Physics Educational Programs. Donations to the fund also support the long-term goal of providing continuous funding for fellowships.

2021
Rachel Glenn

2020
Hayden Scott

2019
Rebecca DiTusa

2017
Shannon Hartzell
Brandon Luckett

2016
Mary Peters Gronberg

2015
Brian Anderson
Laura Bennett
Benjamin Musall

2014
Daniela Branco
Harlee Harrison
Joseph Weygand

2013
Matte McInnis
Olivia Popnoe

2012
Ming Jung Hsieh
Jennifer Sierra Irwin
Dana Lewis
Justin Mikell

2011
Shuaping 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
Kelly Kisling
David Zamora

2007
Triston Dougall
Georgi Georgiev
Ryan G. Lafratta
Malcom 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
Jackeline Santiago

2000
Michael Beach

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

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
Katy Jones

1991
John Bayouth
Robert Praeder
Twyla Willoughby

1990
Maria Graves
John Wallace

1989
Mike Gazda
Scott Jones

DONATION/PLEDGE FORM ROBERT J. SHALEK FELLOWSHIPS IN MEDICAL PHYSICS

Name ______________________________ Title _________________________

Address ____

Email __________________________________ Telephone ______________________

Total Donation/Pledge: (*all contributions are fully tax deductible)*

$100 $200 $500 $1,000 Other $____

Payment Enclosed: ___________

Amount Pledged: ___________ by ________

Does your (or your spouse's) institution/company have a matching gift program?

Yes No

Would you consider making a legacy donation as part of your estate planning?

Yes No

If so, may we contact you to discuss?

Yes No

TO PLEDGE OR DONATE BY CHECK:

Checks should be made payable to: MD Anderson Cancer Center

Mail all donations and pledges to:
Shalek Fellowships
Department of Imaging Physics
Attn: Jeannette McGee, Program Manager
1515 Holcombe Blvd., Unit 1472
Houston, TX 77030

TO DONATE ONLINE:

- Go to: gifts.mdanderson.org
- Proceed by filling in the online donation form
- Check the box for **"I would like to choose where my donation will go."** From the drop down menu, choose **Other** and enter **Robert J. Shalek Fellowship** (this annotation is essential to ensuring that your gift is directed as you intend)

Please send an Email message or forward a copy of your Email donation receipt to Jeannette McGee at jmcgee@mdanderson.org to inform the Program of your gift so that we can thank you as promptly as possible.