MEDICAL PHYSICS ALUMNI NEWSLETTER

SUMMER 2020 | VOLUME 14

Message from the Program Director

Richard E. Wendt, III, Ph.D.

To say that the past year has been merely eventful would hardly do it justice. We have experienced resilience, determination, ability and generosity in full measure from our students, our faculty, and our alumni and friends.

Not long after our most recent in-person alumni event at the 2019 AAPM Annual Meeting in San Antonio, we welcomed the incoming class of 2019. They are Fre'Etta Brooks, Daniel El Basha, Shannon Hartzell, Barbara Marquez, Kelly Nealon, Brandon Reber and Yao Zhao in the PhD program, and Rebecca DiTusa in the SMS program. If you are interested in their statistics and how they carry on the high standard of past entering classes, you can find those figures here: https://gsbs.uth.edu/medphys/faq.htm. That is also a great link to give to any prospective student whom you might know.

In September, the program faculty met to consider the future of the SMS program. The outcome of the meeting was that there would be no change in its status within the Medical Physics Program. Subsequently, the Department of Imaging Physics decided again to welcome SMS students to work on research projects in the department.

A year or two ago, we changed the Shalek Fellowship appeal from a biennial schedule to be an annual request for support. The Shalek funds are not an endowment, but rather we live hand-to-mouth, typically offering whatever support each year that we can afford from the contributions that year. Giving went well through the end of the calendar year, and then early in the new year, an anonymous donor offered to match all gifts up to $15,000. With that news, we received a number of additional, very substantial gifts, that brought our total to $33,850. Then, for the first time, the graduate school recommended a minimum stipend for master's students, which is $24,000 a year. Even with that increase in the cost of supporting an SMS student, thanks to the support of our many donors, we were able to offer our SMS student in the incoming class of 2020 a stipend, fees and tuition so that he can concentrate on his studies. It was that support that enabled him to accept our offer of admission. I would be eager to discuss with any potential benefactors how we might continue to have a matching challenge in the future.

Our admissions for the entering class of 2020 went spectacularly well. Normally, we have an acceptance rate of 75%, and one year recently it was only 50%. Thanks to the hard work of our program admissions committee, faculty interviewers, Anne Baronitis and Frances Quintana, our program manager and coordinator, and most importantly, our students, we had all eight of our PhD offers accepted and one of our two SMS offers accepted. I cannot exaggerate how hard our students worked to help the applicants to appreciate what a great program we have.

Then, just as we had finished in-person interviews and made our offers, the coronavirus pandemic hit, and the world as we knew it changed. At this point, we expect that we will start the fall semester, just as we completed the spring term and are teaching this summer, by delivering remote lectures and meetings with students.

Both our faculty and our students have adapted as well as might be hoped to MD Anderson's decision to have no in-person instruction and to keep students out of the labs and clinical areas.

While teaching and learning over the Internet is not the same as being together in a classroom, we are making the best of the situation. Our biggest challenge, and one that as of this writing is not fully resolved, is how to teach labs that require the laying on of hands.

Continued on next page

After all, ours is a tactile, manipulative profession. Without haptic feedback robotics, a video is not the same as touching the instruments. Our research students have been affected to a varying degree. Those doing largely computational projects have not suffered as many impediments to their work as those who are conducting wet lab experiments. The research labs at MD Anderson have finally been opened back up, and our students are able to roll up their sleeves and restart their experiments while observing the safeguards that have been put in place to minimize the collision cross-section of contagion.

Then, in the first week of June, our dear friend, colleague and mentor, and past director of the graduate program, Ed Jackson, died. A section of reflections on his memory follows later in this newsletter. Suffice it to say here that our program would not be what it is today were it not for Ed.

The pandemic has not been without its benefits. Of the ten students who have defended their PhD dissertations this academic year, nine did so online. Their public seminars were spectacularly well-attended, in some cases from all around the world. All of the defenses were successful and every one of our most recent alumni is going on to either a clinical residency, a hybrid residency and fellowship, or a traditional post-doctoral fellowship.

My special thanks to Frances Quintana for editing and publishing this newsletter along with the many other things she does for the program, to Anne Baronitis, who has worked hard to stay in touch with all of our students while also tracking the moving target of the MD Anderson bureaucracy as it tries to deal with the coronavirus' effects on education, and to Emily Thompson, our student-faculty liaison and her fellow students, especially Soleil Hernandez, but also many, many others for doing so much to enrich student life and promote our program, and then turning on a dime to make the best of the bad situation with the coronavirus.

In a time of high stress and loss, it is nevertheless the case that we have had a year of great accomplishments. Our program is healthy and (virtually) vibrant. I invite you to share in the details of the past year throughout this issue of our alumni newsletter and to rejoice with me in how strong and successful our program is.

Bud Wendt

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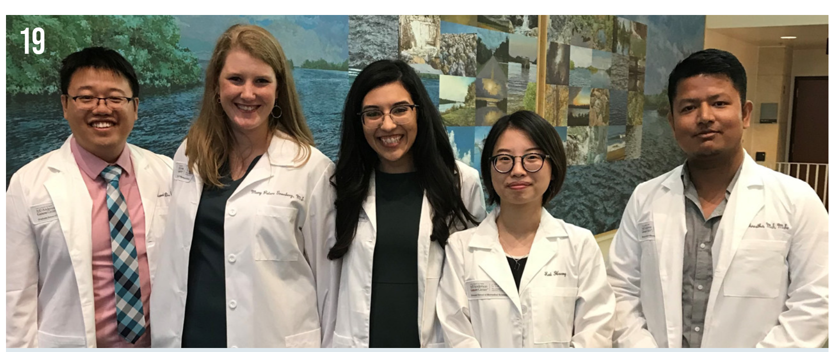
Feedback from alumni is always welcomed by the Program. Please send your suggestions or comments to medicalphysicsprogram@mdanderson.org



L-R Tianzhe Li, Mary Gronberg, Soleil Hernandez, Kai Huang, and Suman Shrestha at the GSBS White Coat Ceremony.

GREETINGS FROM THE PROGRAM OFFICE

By Anne Baronitis, Program Manager, Education

This time last year, many of us were enjoying a roaring time at the Alumni Reception on the Riverwalk in San Antonio with plans to next come together in Vancouver, but as you know, this year has not gone according to plans.

The 2019-20 academic year began as usual with our new students and trainees starting last July and August. Along with myriad activities, this year's student council added a new student liaison position and expanded on the student mentor program, creating additional programming to help new students transition to graduate school. I'd like to give a huge shout-out to Emily Thompson, Constance Owens, Shannon Hartzell and Soleil Hernandez for their hard work and dedication to the program as well as their fellow students. The fall semester chugged along like many others as students started classes and settled into their tutorials and labs.

Finding Our New Normal

Then along came the chaos, aka COVID-19. Suddenly, we were all thrust into this new concept of working (and attending classes) from home. We quickly got everyone set up and moved classes onto WebEx, with virtual student defenses enabling a tremendous increase in attendance. Together, we overcame the hiccups that appeared along the way as we all adjusted to the new, not-so-normal work routines. Soon, video conferencing with our families and joining classes with pets in the background became normal, as well as dressing casually, at least from the waist up!

Texts, emails, calls and FaceTime allowed us to stay connected and adjust to the constantly changing new guidance coming down from various leaders and areas. Our new Town Halls had topics ranging from WFH strategies to virtual happy hours to making the most of an online AAPM. We held WebEx Pictionary and themed Zoom calls but often just wanted to connect with our friends and colleagues.

Working Through It Together

So, here we are in July, staying home and hopefully staying safe. We look forward to a vaccine that will enable us to get back together again, and we continue to learn new techniques to build relationships from the safety of our homes and apartments. Yet, I miss the days of students coming to my office for questions, encouragement and snacks. My candy bowl grows stale in the months of sitting in an empty office with no end in sight to WFH.

With my retirement coming at year's end, I am saddened that I won't have much opportunity to spend time in-person with my beloved colleagues and students. However, I hold out hope to continue connecting virtually as I move to the next phase in my life. It has been my honor and privilege to work in the Department of Imaging Physics and with the Medical Physics Program and Residency Program in my final years of work, just as it was 20 plus years ago when I first worked at the GSBS at a time when some of the faculty were students. Thank you especially to Frances Quintana, Bud Wendt, Anthony Liu, Rose Delphin, Marnie Copeland, and all those that will remain in my heart for years to come.

PROGRAM HIGHLIGHTS

The Medical Physics Program kicked off the 2019-20 academic year with an orientation welcome party for new students. Current students and some faculty attended a dinner at the home of Anne Baronitis, giving the newbies a chance to interact with everyone over a casual dinner. This event that has now become an annual tradition.

Top row, L/R: Brandon Reber, Trever Mitcham, Richard Bouchard, Benjamin Lopez, Suman Shrestha, Keith Michel, Gabriel Sawakuchi, Yao Zhao, Brigid McDonald, Tucker Netherton, Stephen Kry, Bud Wendt, Marnie Copeland, Frances Quintana. Second row L/R: David Flint, Carlos Cardenas, Soleil Hernandez, Rebecca DiTusa, Kelly Nealon, Daniel El Basha, Barbara Marquez, Rebecca Howell, Mary Gronberg. Third row L/R: Saleh Ramezani, Constance Owens, Daniela Branco, Benjamin Musall, Cayla Zandbergen, Fre'Etta Brooks, Don Baronitis, Anne, Baronitis. Bottom row, L/R: Aashish Gupta, Shannon Hartzell, Tianzhe Li, Jinzhong Yang.

L/R: Margaret Copeland and Rebecca Howell

L/R: David Flint, Shannon Hartzell, and Anne Baronitis

Clockwise Aashish Gupta, Daniel El Basha, Barbara Marquez, Rebecca DiTusa, Suman Shrestha, Kelly Nealon, Mary Gronberg, Soleil Hernandez and Fre'Etta Brooks

L/R: Constance Owens, Daniela Branco, Carlos Cardenas and David Flint

PROGRAM HIGHLIGHTS

As the first year liaison in student council, Soleil organized an abstract writing tutorial for first years. First year's mentors were encouraged to also attend, to provide a panel of tips and tricks for conference submissions.

Pictured above clockwise: Shannon Hartzell, Evan Gates, Yao Zhao, Barbara Marquez, Mary Gronberg, Daniel El Basha, Brandon Reber, Kelly Nealon, Tianzhe Li, Constance Owens, and Rebecca DiTusa.

RESEARCH AND CLINIC TOUR

Pictured above are first year students, Barbara Marquez, Kelly Nealon, Rebecca DiTusa, Brandon Reber, Daniel El Basha, Yao Zhao, and Dr. Narayan Sahoo

First year liaison, Soleil Hernandez, organized a tour of various clinical and research facilities during orientation week for the first year students. The tour included the clinical space on the main campus, the research labs and equipment in SCRB3 and the Proton Therapy Center (PTC). Pictured here is Dr. Narayan Sahoo leading a tour of the fixed beam treatment room at the PTC. With this tour, students were able to get hands-on experience with equipment, meet faculty, and see the labs where our students work on a day to day basis.

PEER-MENTOR LUNCH AT THE BLACK WALNUT

Pictured clockwise: Evan Gates, Brandon Reber, Daniel El Basha, Mary Gronberg, Fre'Etta Brooks, Constance Owens, Rebecca DiTusa, Kelly Nealon, Barbara Marquez, Daniela Branco, and Soleil Hernandez

The senior students of the peer mentorship program, led by Soleil Hernandez, hosted an orientation dinner for the incoming first years. In the peer mentorship program, each incoming student is paired with a more senior student to help them become socially and academically acclimated to graduate school and Houston. This was our first time hosting this event during orientation week and allowed for a great opportunity to interact as a group in a relaxing setting after a long day of orientation!

MEET THE INCOMING CLASS OF 2020

Medical Physics Admissions BY THE NUMBERS

76 Applications received

21 Applicants interviewed

16 Attended Interview Weekends

5 Conducted through Skype

10 Offers made

9 Matriculating

AVERAGE SCORES OF Matriculating Students

UNDERGRADUATE GPA	3.56
GRADUATE GPA	3.71
VERBAL GRE	157
QUANTITATIVE GRE	163
ANALYTICAL GRE	4.44

Hana Baroudi
American University of Beirut

Xinru Chen, M.S.
Duke Kunshan University

Joseph DeCunha, M.S.
McGill University

Benjamin Insley
Brown University

David Martinus
Purdue University

Hunter Mehrens, M.S.
University of Pittsburgh

Samuel Mulder
Abilene Christian University

Hayden Scott
LSU & A&M College, Baton Rouge

Paige Taylor, M.S.
University of Texas Health Science Center Houston-GSBS

A Message from the 2019-20 Student-Faculty Liaison EmilyThompson

The 2019-2020 academic year proved very successful for our Med Phys student body. Our students have done a tremendous job making presentations, publishing articles, authoring manuscripts, earning grants and winning awards. Students published a total of 12 first-authored manuscripts and 8 co-authored manuscripts, 3 first-authored manuscripts and many co-authored manuscripts that are still under review. Additionally, our students had 34 abstracts accepted, won 27 awards, and brought in over $205,000 in grant funding this year.

The Medical Physics Student Council hosted a variety of events throughout this past year to improve the graduate school experience for our students. We kicked off the new school year with dinner at program manager Anne Baronitis' home and ended orientation week with the 5th annual Med Phys pool party. We were able to make a number of improvements to orientation week including a "Tips and Tricks" session hosted by Emily Thompson and a tour of campus facilities. We also completely overhauled the interview weekend schedule to now include individual and panel interviews with faculty, more student interaction time, and a tour of student apartments and local housing options. Thanks to several of our gracious alumni, we were also able to host our first-ever Alumni Panel and first meetings about increasing student/alumni involvement which we hope will become more prevalent in the future.

This year, we added the new student council position of First-Year Liaison held by Soleil Hernandez. Soleil was instrumental in building our Big Brother/Big Sister program and hosted a series of mentor/mentee events as well as workshops on topics such as "How to Find an Advisor." Our Education Representative, Constance Owens, did a wonderful job hosting homework help and ABR Part 1 prep sessions as well as the PhD Candidacy presentation and peer-practice program. Shannon Hartzell, Social Chair, organized a variety of social activities including flag football and softball intramural sports teams. I would like to note that our flag football team, The Beam Hardeners, made it to playoffs for the first time!

Over the past year, our students have done an exceptional job of representing our Med Phys program outside of traditional program activities. Together, we have won more GSBS scholarship and fellowship awards than ever before and we've increased our representation in GSBS student organizations with several of our students now holding leadership positions. Student volunteerism is at an all-time high with our students volunteering on numerous AAPM subcommittees and at a number of local organizations including animal shelters, Ronald McDonald House, Texas Children's Hospital, and the Houston Livestock Show and Rodeo, just to name a few. As a program, we participated in the GSBS Outreach Science Night, where kids learned about Medical Physics through a Monte Carlo Plinko game and electrical circuits made of play dough.

COVID-19 has changed the landscape of graduate school and I would like to commend our students and professors on their flexibility during these challenging times. While we are disappointed in cancelled conference travel and events such as the Annual Medical Physics Student Retreat and first ever Etiquette Workshop and Alumni Networking Social Hour, we are working to make the best of online classes, virtual conferences, and working from home in this era of social distancing.

On behalf of the Medical Physics Student Council, I would like to thank Dr. Wendt, Anne Baronitis, and Frances Quintana for the countless hours spent helping turn our visions into reality. It's been an honor to serve as Student-Faculty Liaison and I am so proud of everything we've accomplished as a student body. I look forward to everything our new representatives have in store for next year!

Always remember "there's no such thing as a free lunch" – Dr. Wendt.

Sincerely,
Emily Thompson

2020-2021 STUDENT COUNCIL

Constance Owens

Emily Thompson

Student-Faculty Liaison
Co-Chairs

Evan Gates
Education
Representative

Benjamin Musall
Social Chair

Barbara Marquez
First Year Student
Liaison

Thank You to the
2019-2020
Student Council
Representatives
for their
Outstanding
Service!

Emily Thompson
Student-Faculty Liaison

Constance Owens
Education Representative

Shannon Hartzell
Social Chair

Soleil Hernandez
First Year Student Liaison

STUDENT AWARDS

ALLIED SCIENTIST TRAINING GRANT FROM THE SOCIETY OF INTERVENTIONAL RADIOLOGY FOUNDATION
Emily Thompson (Advisor: Erik Cressman, M.D., Ph.D.)
Brian Anderson (Advisor: Kristy Brock, Ph.D.)

AMERICAN LEGION AUXILIARY FELLOWSHIP
Evan Gates (Advisor: David Fuentes, Ph.D.)
Benjamin Musall (Advisor: Jingfei Ma, Ph.D.)
Emily Thompson (Advisor: Erik Cressman, M.D., Ph.D.)

CITY FEDERATION OF WOMEN'S CLUB ENDOWED SCHOLARSHIP IN BIOMEDICAL SCIENCES
Joshua Gray (Advisor: Steven Millward, Ph.D.)

2020 CPRIT GRADUATE SCHOLAR AWARD
Emily Thompson (Advisor: Erik Cressman, M.D., Ph.D.)

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

ELLEN TAYLOR GOLDIN LEGACY SCHOLARSHIP
Dong Joo Rhee (Advisor: Laurence Court, Ph.D.)

FEDERATION OF HOUSTON PROFESSIONAL WOMEN EDUCATION FOUNDATION SCHOLARSHIP
Emily Thompson (Advisor: Erik Cressman, M.D., Ph.D.)

ISMRM 2020 RESEARCH EXCHANGE PROGRAM
Brigid McDonald (Advisor: Clifton Fuller, M.D., Ph.D.)

JOHN J. KOPCHICK FELLOWSHIP
Brian Anderson (Advisor: Kristy Brock, Ph.D.)
Brigid McDonald (Advisor: Clifton Fuller, M.D., Ph.D.)

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

MARILYN AND FREDERICK R. LUMMIS, JR., M.D., FELLOWSHIP IN THE BIOMEDICAL SCIENCES
Suman Shrestha (Advisor: Rebecca M. Howell, Ph.D.)

NATIONAL SCIENCE FOUNDATION GRADUATE RESEARCH FELLOWSHIP
Daniel El Basha (Advisor: Laurence E. Court, Ph.D.)

NLM TRAINING PROGRAM FELLOWSHIP WITH THE GULF COAST CONSORTIA
Evan Gates (Advisor: David Fuentes, Ph.D.)

THE FADINE JACKSON ROQUEMORE SCHOLARSHIP IN CANCER RESEARCH
Tucker Netherton (Advisor: Laurence E. Court, Ph.D.)

SCHISSLER FOUNDATION FELLOWSHIP
Yasaman Barekatain (Advisor: Florian Muller, Ph.D.)

SYLVAN RODRIGUEZ FOUNDATION SCHOLARSHIP HONORING GEORGE M. STANCEL, PH.D.
Suman Shrestha (Advisor: Rebecca M. Howell, Ph.D.)

WALTRIP IMPERIAL GUARD ALUMNAE SCHOLARSHIP
Emily Thompson (Advisor: Erik Cressman, M.D., Ph.D.)

WINTER INSTITUTE OF MEDICAL PHYSICS EARLY CAREER SCHOLARSHIP
Brigid McDonald (Advisor: Clifton Fuller, M.D., Ph.D.)

The 2019-2020 American Legion Auxiliary Fellowship Awards Luncheon was held on Friday, October 18, 2019, to celebrate and award the hard-working researchers. Recipients in the Medical Physics Graduate Program are Mary Gronberg, Evan Gates, Benjamin Musall, and Emily Thompson. Photo courtesy of GSBS and Tracey Barnett.

STUDENT RECOGNITION

Sharbacha Edward (Advisor: Stephen F. Kry, Ph.D.)
- 2nd place in GSBS Annual Report Scientific Writing Competition
- 2nd place in GSBS Elevator Speech Competition

Mary Gronberg (Advisor: Laurence E. Court, Ph.D.)
- 2020, Vice President of GSBS Community Outreach
- 2nd place team AAPM Grand Challenge: Dose Stream of the Open Knowledge-Based Planning Challenge
- Travel Award, GSBS

Aashish Gupta (Advisor: Rebecca M. Howell, Ph.D.)
- 1st place Poster Competition, SW-AAPM

Shannon Hartzell (Advisor: Stephen F. Kry, Ph.D.)
- 2019 Student Council, Social Representative
- Travel Award, Particle Therapy Co-Operative Group

Yulun He (Advisor: Kristy Brock, Ph.D.)
- DI Trainee Research Symposium Award
- Travel Award, GSBS

Soleil Hernandez (Advisor: Laurence E. Court, Ph.D.)
- 2019 Student Council, 1st Year Student Liaison
- 1st place Young Investigator Symposium, AAPM SW-Chapter
- 1st place Grand SLAM Talk, SW-AAPM
- 2nd place, People's Choice, GSBS Graduate Student Research Day Elevator Speech Competition
- Honorable Mention, 2020 National Science Foundation Graduate Research Fellowship
- Travel Award, GSBS

Kai Huang (Advisor: Laurence E. Court, Ph.D.)
- Travel Award, GSBS

Tucker Netherton (Advisor: Laurence E. Court, Ph.D.)
- 2nd place AAPM Grand Challenge: Open Knowledge-Based Planning Challenge
- Oral Presentation, AAPM 2020
- Travel Award, GSBS

Constance Owens (Advisor: Rebecca Howell, Ph.D.)
- 2019 Student Council, Education Representative
- Travel Award, NCI-Sponsored

Dong Joo Rhee (Advisor: Laurence E. Court, Ph.D.)
- 2nd place, AAPM Grand Challenge: Open Knowledge-Based Planning Challenge

Saleh Ramezani (Advisor: Mary C. Farach-Carson, Ph.D.)
- People's Choice, GSBS Graduate Student Research Day Elevator Speech Competition

Suman Shrestha (Advisor: Rebecca Howell, Ph.D.)
- 2nd Runner up Poster Competition, AAPM SW-Chapter
- Radiation Oncology Commendation (ROC-STaR)
- Travel Award, Health Physics Society
- Travel Award, GSBS (ESTRO)
- Travel Award, NCI International Travel

Emily Thompson (Advisor: Erik Cressman, M.D., Ph.D.)
- 2019 Student Council, Student-Faculty Liaison
- 2020 Secretary of the Association of Student Communication
- Travel Award, AAPM Expanding Horizons
- Travel Award, CPRIT
- Travel Award, GSBS
- Travel Award, Society for Thermal Medicine Scholar-In-Training

Cayla Zandbergen (Advisor: Richard Bouchard, Ph.D.)
- Travel Award, GSBS
- Travel Award, IEEE

Suman Shrestha at the 2020 ASTRO Annual Meeting

PHYSICS IN THE PANDEMIC:
'DURING CHALLENGES, WHAT YOU FOCUS ON MATTERS A LOT'

This post is written by graduate student, Suman Shrestha and is part of a series on how the COVID-19 pandemic is affecting the personal and professional lives of physicists around the world. This post is published in Physics World Magazine.

By Graduate Research Assistant, Suman Shestha. Published in Physics World Magazine

Amid the current challenges of the COVID-19 pandemic, I saw our institution's core values (caring, integrity and discovery) shine through brighter than ever. Here at MD Anderson, we did much more than react – we responded! As a scientist in training in the biggest medical center in the world and the number one cancer center in the US, we were vigilant from the outset. Leadership from both fronts was exceptional, which helped students and trainees like me do our job.

> "It is not what happens to you, but how you react to it that matters" –Epictetus.

As I write this blog article on my home computer, I am approaching the 14th hour of screen time just for today. For some, this might seem high, but for me, a doctoral research fellow with a computational project involving a vast amount of data and lots of programming, it's a normal day. Like most well established educational institutions, we have transitioned to online lectures, virtual meetings and remote working now. This is already my third week working from home, so I am well settled (having an excellent home office since the beginning helped a lot).

So, what is different? I don't get to walk to the office, go to the gym and have social interactions that were part of life a couple of weeks ago. In-class lectures and research meetings are now virtual (but effective); my $29 pull-up bar and living room is my gym. Though I lean towards the introvert side of the personality scale, in the 21st century, we have many ways to stay connected so that is never a problem. As of last week, if needed, I could go to my office after hours and on weekends, as all other workers would be relieved for the day.

Every day I wake up in the morning, freshen up, try some form of a home workout, make some coffee, breakfast, and call home. As an international student from Nepal, family time is a must for me, and now some of it is taken up by COVID-19. I inform my family about real developments and measures to stay safe. Nepal had a first positive case just this week and has gone into lockdown for a week. As a developing country with limited medical capability, stricter measures must be taken to ensure safety. After the call, I move on to my home office and start working as I would any other day.

I am lucky to be educated enough and experienced enough to make an informed decision during the current situation.

Continued on page 13

I have had first-hand experience of chaos and death in the 2015 earthquake in Nepal that took close to 9000 lives and caused about 22,000 injuries. During challenges, what you focus on matters a lot.

When some misguided individuals were frolicking on beaches or having picnics in parks, medical professionals were fighting this pandemic on the front line, essential supply-chain personnel were working intensely to get supplies to us, researchers were pushing the boundary of knowledge.

It is admittedly frustrating to see some disregard the enormity of the situation, but I know that enough people were doing their best and will do the right thing. We will surely come out on top of this situation. Amid this chaos, institutional leadership and peer support have been excellent here and I am proud to be a part of this establishment.

Though some of my friends have had to stop their research as their lab shuts down for an indefinite time, I can practically keep working as normal with some minor modifications. I am utilizing this time to wrap up two first-author manuscripts from my work in MD Anderson Late Effects Research Group. Many of us are doing our part by staying home and pausing laboratory research to maintain social distance, but some of us can keep pushing the boundary of knowledge as we are uniquely positioned to do so. I think that it is not only possible, but we must do so more than ever before.

As a human, I must admit that I am not always positive or successful in utilizing the whole day. Some social-media posts or news stories break my heart, but some fill me with hope. Amid this chaos, I will personally keep doing my very best and expect the same from everyone out there.

Photo courtesy of Tracey Barnett, MD Anderson UT Health Graduate School of Biomedical Sciences

Suman Shrestha is a PhD student contributor to Physics World. He graduated from Tribhuvan University, Nepal, with an MS in physics (2013) and Louisiana State University with a MS in medical physics (2018). He is a doctoral research fellow in the medical physics program at MD Anderson Cancer Center and UTHealth Graduate School of Biomedical Sciences. He serves as investigator on multiple research projects funded by UTHealth and Childhood Cancer Survivor Study (CCSS). His research focus is on developing models to predict the risk of late cardiac disease from radiotherapy techniques. His goal is to become an independent researcher, licensed medical physicist and a tenured professor. He plans to contribute *to healthcare reform in developing countries.*

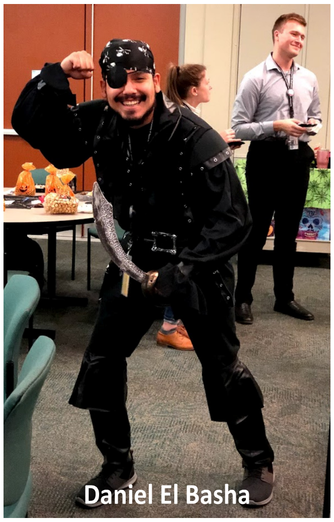
UW-GE MR PROGRAMMING WORKSHOP

Benjamin Musall and Christopher Walker participated in a workshop designed for beginners learning how to use the pulse sequence and reconstruction tools available for researchers on the GE MR platforms. The subject of the training is pulse sequence programming, which is important for implementing research ideas on MRI scanners. Participants learned GE EPIC pulse sequence design and Orchestra image reconstruction tools through a mixture of pre-recorded lectures, interactive discussion sessions, and self-guided programming exercises. Attendees were expected to spend at least 5-6 hours per week on the course.

ESTRO 39, NETHERLANDS

PhD student, Soleil Hernandez attended ESTRO's pediatric radiotherapy course at The University Medical Center Utrecht in Utrecht, Netherlands. The 3-day course is jointly organized by ESTRO and PROS (pediatric radiation oncology society) and includes 16 hours of lectures and 5 hours of case discussions. The course is meant for trainees and specialists in pediatric radiation oncology. The aim of the course is to address radiation oncology treatment technologies and provide a comprehensive knowledge of how pediatric malignancies are managed. The course covers a variety of a topics including: basic aspects of pediatric oncology, epidemiology, imaging, staging, clinical trials, modern radiation therapy, and case discussions. By the end of this course Soleil learned basic pathological and biological aspects of the most common pediatric malignancies, planning strategies, delivery techniques, cure rates, toxicity profiles, and radiological anatomy for precise treatment planning.

2019 DIRECTOR-STUDENT FALL MEETING



Daniel El Basha

Fre'Etta Brooks

Evan Gates

Barbara Marquez

Keith Michel

Travis Salzillo

Daniela Branco

Daniela Branco and David Flint

L/R: Rebecca Howell, Shannon Hartzell, Soleil Hernandez, Yulun He, Daniela Branco, and Trevor Mitcham

David Flint and Emily Thompson

2019 DIRECTOR-STUDENT FALL MEETING

The annual Fall Director-Student meeting was held on Halloween. The attendees dressed in costume, played games and received treat bags, as not all physics is serious all of the time.

Top, L/R: Cayla Zandbergen, Evan Gates, Sharbacha Edward, Fre'Etta Brooks, and Mary Gronberg

L/R: Aashish Gupta and Daniel El Basha

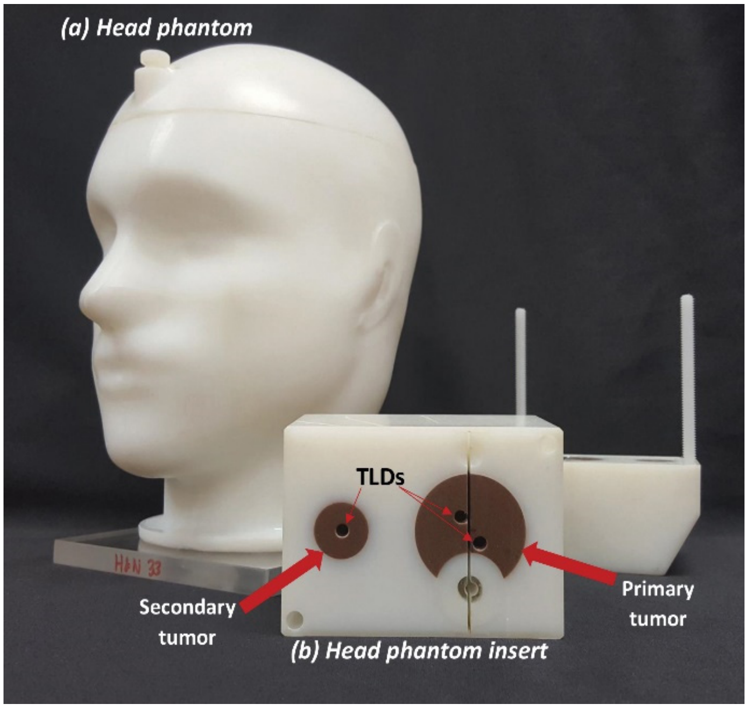
L/R: DJ Rhee and Cenji Yu

Anne Baronitis

PERFECTING RADIATION THERAPY
ONE DUMMY AT A TIME

By GSBS student, Sharbacha Edward

“But… if we can’t see the radiation, how do we know that it’s hitting my tumor?” Mariana* thought to herself, as she laid on the treatment table and watched this huge machine rotate across her chest. Since being diagnosed with lung cancer three months prior, it had been an emotional roller coaster ride, which she hoped would end in cancer remission after this round of radiation therapy.



Like Mariana, over half of all diagnosed cancer patients receive some form of radiation therapy. The radiation is delivered using machines called linear accelerators (LINAC), which have the capability to produce high-energy photons and electrons. The radiation oncology teams at cancer centers like MD Anderson use these high-energy particles as weapons against cancer cells and tumors. They are able to direct the radiation so that it causes maximum damage to the tumor while simultaneously leaving healthy tissue unharmed.

However, Mariana does have a legitimate concern. Radiation is not visible to the naked eye. So how do technicians ensure that it goes in the right location? How do doctors and researchers know that the photons pulverized the tumor but not the delicate lung tissue that surrounds it? With practice of course!

The Imaging and Radiation Oncology Core (IROC), a subsidiary of MD Anderson, has developed and built a number of dummy patients called phantoms, which are used to test the accuracy and precision of radiation therapy around the world. These tests are done before cancer centers can enroll patients in clinical trials, or as a check of their radiation systems and clinical processes. There are different phantoms that mimic different disease sites, including head, spine, lung, and even the prostate. The phantoms are made up of materials that represent the human anatomy they simulate, such as dense polymers for bone and lighter cork for lung tissue. They also have tumors in different locations to mimic typical cancer occurrence.

When a cancer center receives an IROC phantom, their goal is to treat the phantom like they would a patient. They take computed tomography (CT) images, create a treatment plan, and deliver radiation to the phantom’s tumor, while aiming to spare the healthy surrounding tissue. In order to determine whether this is done successfully, IROC places tiny dose measurement devices, called thermoluminescent dosimeters (TLD) inside the tumor and sensitive organs (e.g., heart and spinal cord), before the phantom is shipped to a center for radiation treatment.

Continued on page 18

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When the phantom is returned after treatment, IROC personnel read the radiation dose recorded by the TLDs. These doses are then compared to the doses which were calculated by the treatment plan created for that phantom, and a dose agreement within ±7% constitutes a successful phantom treatment. This is a test of a cancer center's ability to accurately create a plan to deliver radiation and then successfully deliver that plan to the exact spot inside the phantom that they intended to. This is a team effort, and so the entire process from start to end, involving all members of the radiation oncology team, is being tested on these dummy patients in order to perfect it for real patient treatment.

IROC has operated this phantom program for almost two decades, and has collected thousands of phantom results from institutions all over the U.S. and the world. The failure rate, on average, for all phantoms is 15%. This means that 15% of the time, the phantom is incorrectly treated by a cancer center. These results raise very real concerns about the accuracy of actual patient treatments. If a cancer center cannot accurately direct radiation to the tumor in a phantom, how do they handle tumors in actual patients?

This is a major problem, and the first step to solving it is knowing exactly what causes clinics to perform poorly when administering radiation to cancer patients. This is the crux and focus of our research. Whether deemed a pass or fail, all these phantom tests provide invaluable data for us to study. We aim to use phantom test data to investigate trends, patterns and pitfalls in order to gain knowledge about the areas of the treatment process that need improvement. We are evaluating potential causes of error, such as dose calculation inaccuracies, treatment complexity, and LINAC calibration problems. Uncovering the root problems that cause the radiation oncology team to fail these phantom tests will equip us with the knowledge required to help centers improve their radiation treatment process, and thereby improve the success of their patient treatments.

So, although Mariana cannot see the radiation that is being directed at her tumor, we can see it through our phantoms and through our research. As the machine moves its way back across from her left side to the right, we are continuously working to ensure that every photon that enters her body will attack the tumor head on!

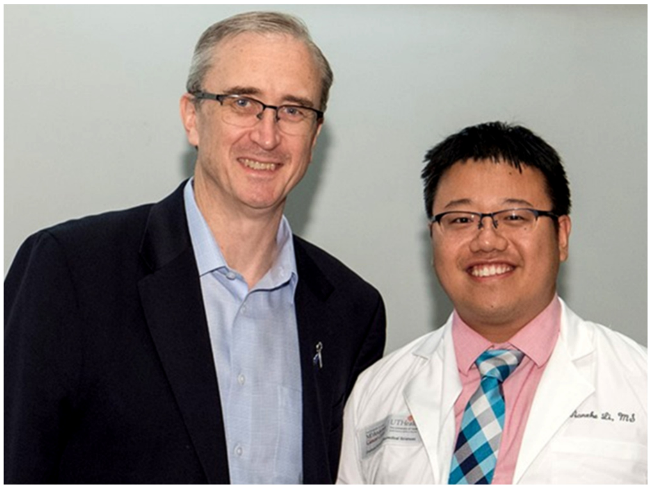
Through this work, patient treatments will improve, and subsequently so will patient outcomes and survival not just in the U.S., but around the world.

**Mariana is a fictitious name and no patient information was used for this story.*

This article was written by student Sharbacha Edward, the second place winner of the 2019 Annual Report Science Writing Contest. Edward is a PhD student with the Program in Medical Physics and her advisor is Stephen Kry, PhD.

Lab Coat Ceremony

On Friday, September 20 the annual lab coat ceremony was held to recognize the second year students as they receive lab coats from their new advisors. GSBS students and faculty were in attendance along with family and friends. A reception in the Onstead Forum followed the ceremony. Above from left to right, GSBS Graduate Research Assistants, Tianzhe Li, Mary Gronberg, Soleil Hernandez, Kai Huang, and Suman Shrestha.



Marty Pagel, Ph.D. and Tianzhe Li

Suman Shrestha and Rebecca Howell, Ph.D.

Mohammad Salehpour, Ph.D. and Mary Gronberg

Kai Huang, Carlos Cardenas, Ph.D., and Soleil Hernandez

Photos courtesy of Tracey Barnett, MD Anderson UT Health Graduate School of Biomedical Sciences

Tips and Tricks for Choosing an Advisor

A Mentorship Initiative by MD Anderson's Medical Physics Program

By Soleil Hernandez

Published in the January/February 2020 Issue of the AAPM Newsletter

The Medical Physics peer-mentorship program at MD Anderson is an initiative led by the student body to help first year students become academically and socially acclimated to graduate school. This is a volunteer-based program where each first year student is paired with a more senior student to foster an integrated environment between newcomers and the upper classmen. Throughout the year, the peer-mentorship program organizes various luncheons that help facilitate communication between mentors and mentees. One of the key decisions students will face in their first year in our program is selecting an advisor. With this in mind, the veteran students at MD Anderson led a "Tips and Tricks for Choosing an Advisor" session to help guide students in their decision making process. This meeting was organized as a casual question and answer session. Both first year students and mentors submitted questions prior to the session. These questions as well as the discussion that followed are summarized below:

Q1. Should I prioritize a project that I like or a PI that I like?

Most veteran students agreed that this is a personal decision that depends on the student. For most, prioritizing a PI that could help see a project through from start to finish was the most important priority when selecting an advisor. Having a project that you love can be complicated by an unsupportive advisor. At the end of the day, you want someone who will support a positive learning environment and give you guidance on how to best advance your project. Students also noted that having an advisor who supports them outside of research is also important as there are many milestones to overcome in our program such as coursework, the candidacy exam, and committee meetings. Students also emphasized that you should not rely on a professors reputation and should talk to the students in that group to get the best idea of what type of person works well with that advisor.

Q2. How much emphasis should I put on my advisors expectation of my work/life balance?

This answer was dependent on the student. The consensus was that you should pick an advisor who supports the lifestyle that you would like to live. For some students, their project is their most important priority at this phase of life, and for them, they prefer to spend long hours in the lab advancing their project as this brings them the most fulfillment. For other students, it was essential to have an advisor who supports taking breaks and making time for activities outside of their project. Many students stated that their productivity increased after stepping away from their project to clear their heads. The veteran students unanimously agreed that it was important to them to select an advisor who was supportive of taking breaks to see family, especially for big life moments and emergencies.

Q3. What are the pros and cons of having a "hands-on" versus "hands-off" advisor?

In this session, we defined hands on as having multiple meetings a week and hands off as having a professor who travels often and meets on an as needed basis. The pros discussed for the hands on advisors was that when students were faced with difficulties, they were able to quickly get help. Some students found that meeting weekly held them accountable and maximized their productivity. One con of the hands on advisor was that some students may feel pressured to produce enough progress each week to keep their advisor satisfied with their progress. The pros of the hands off advisor was that it gave students who are more independent the freedom to advance their project at their own pace. The cons expressed were that their advisor may not always be aware of problems in their projects as they arise.

Continued on page 21

Q4. Is the number of students graduated by that advisor an important factor to consider?

The consensus was that it is important to have an advisor who has graduated a student or who has served on a student's committee so that they understand the milestones that must be achieved before graduating a student. Another important factor expressed was that advisors who have multiple students have a better ability to formulate a cohesive project in a reasonable PhD time-frame. Additionally it was mentioned that an advisor who may not have graduated a student in many years may be difficult to work with since they may be unfamiliar with the expectations of a PhD student. For our program specifically, there are countless regulations set by the graduate school that we must remain accountable for and it is helpful to have an advisor who is familiar with these milestones.

Q5. How much emphasis should I put on the lab environment?

The answer to this question was dependent on the student. Most students agreed that this was an important factor to consider. For some students, their lab environment included working with post docs that served as liaisons to their advisor. In this case, it was important to have a positive learning environment with the post doc. Other students from larger labs emphasized how comradery and team science really helps them progress through their PhD. These students claimed that group meetings were helpful in troubleshooting aspects of their project as well as developing new ideas. These students also found that having a large lab was helpful in learning interpersonal skills since they are constantly working with different personalities. Students also mentioned that it was helpful to have labs with students who were willing to help edit abstracts and manuscripts.

Q6. Is it okay to ask how long my project will take?

Yes! The consensus was that not only is it okay to ask what your advisors expectations are, but it is important to establish and update a timeline for your project so that you can hold yourself accountable. Students also emphasized that is important to have a project that you have the resources and knowledge to achieve in a reasonable amount of time. Students recommended laying out the project with the advisor as well as the expectations of what resources will be needed to achieve the project. One student in particular mentioned that having a timeline that you maintain over the course of your PhD is helpful to remind your advisor of all that you've accomplished.

Q7. What kind of qualities about your advisor help you reach your career goals?

Students mentioned that their advisors encourage them to apply for external fellowships and guide them throughout the application process. Other students noted that their advisors allow them to travel and present their research which is important to professional development. Students mentioned their advisors have been supportive of allowing them to take additional courses at other institutions as well as courses sponsored by professional organizations.

Q8. Can I work with an advisor who may have limited funding?

Most students agreed that while it is possible to work with an advisor with limited funding, it is a tricky process. Students noted that there are many benefits to choosing an advisor with adequate funding but acknowledge that some students may not have this option. In this case, students recommended applying for external fellowships before committing to that advisor to secure funding.

Medical Physics Mentors and Mentees clockwise: Barbara Marquez, Kelly Nealon, Brandon Reber, Mary Gronberg, Fre'Etta Brooks, Daniel El Basha, Tianzhe Li, Yao Zhao, Daniela Branco, Rebecca DiTusa, Shannon Hartzell, and Yulun He. Not pictured: Soleil Hernandez and Evan Gates

Acknowledgment:

This session was led entirely by students at all stages of our program and these opinions are our own. We would like to thank our program director, Dr. Wendt, for providing us with the resources to sustain a peer mentorship program.

2020 PHD GRADUATES

Joseph G. Meier, Ph.D.
Advisor: Osama Mawlawi, Ph.D.
Imaging Residency
Madison-Wisconsin

Jeremiah Sanders, Ph.D.
Advisor: Jingfei Ma, Ph.D.
Imaging Residency
MD Anderson Cancer Center

Kristine L. Ferrone, Ph.D.
Advisor(s): Charles E. Willis, Ph.D. and
Stephen F. Kry, Ph.D.
Lead Scientist
The Aerospace Corporation

Daniela Branco, Ph.D.
Advisor: David Followill, Ph.D.
Therapy Residency
UC-San Diego

Mallory Glenn, Ph.D.
Advisor: Stephen F. Kry, Ph.D.
Therapy Residency
UW-Madison

Joshua P. Gray, Ph.D.
Advisor: Steven Millward, Ph.D.
Postdoctoral Fellow
MD Anderson Cancer Center

Maureen Aliru, Ph.D.
Advisor: Sunil Krishnan, M.D., Ph.D.
UTHealth Medical School

Travis C. Salzillo, Ph.D.
Advisor: Pratip Bhattacharya, Ph.D.
Therapy Residency
MD Anderson Cancer Center

Keith A. Michel, Ph.D.
Advisor: James Bankson, Ph.D.
Imaging Residency
MD Anderson Cancer Center

David B. Flint, Ph.D.
Advisor: Gabriel Sawakuchi, PhD
Therapy Residency
MD Anderson Cancer Center

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

JOSEPH G. MEIER, PH.D.

Assessment of New Innovations in PET/CT for Respiratory Motion Correction

In oncological imaging, Positron Emission Tomography/Computed Tomography (PET/CT) is a vital tool used for stating and treatment response assessment of patients due to its ability to visualize and accurately quantify the bio-distribution of radiolabeled pharmaceuticals. However, due to the long acquisition times, respiratory motion blur is unavoidable in PET images especially in the lower lung and upper abdomen. This leads to reductions in measured radiotracer concentration and lesion detectability all of which can potentially result in incorrect management of patients. Multiple methods exist to correct for respiratory motion but are rarely used in the routine clinical setting because of: 1) increased image noise due to the rejection of motion blurred data; 2) burdensome workflows which require setup and troubleshooting of external hardware needed to track patient breathing; 3) and ineffective respiratory motion correction due to irregular patient breathing potentially caused by the abrupt bed transitions during step and shoot (SS) whole body PET acquisition.

Our goal of this Ph.D. dissertation is to address these three issues by evaluating 1) a pre-commercial version of a vendor designed elastic motion correction (EMC) algorithm which uses all of the acquired PET data resulting in reduced image noise; 2) a pre-commercial version of a vendor designed data driven gating (DDG) algorithm, which determines the respiratory waveform from the PET data alone, thereby removing the need for and challenges of external hardware; 3) the effect of using continuous bed motion (CBM) as compared to SS as a means to minimize the irregularity of patient breathing.

The results of these evaluations showed that the EMC algorithm performed similarly to conventional respiratory motion correction techniques with respect to radiotracer quantification, however, due to using all of the acquired PET data, the EMC algorithm showed improved performance resulting in the lowest amount of image noise, improved contrast to noise ratio, and had the highest overall image quality scores as assessed by independent observers. Evaluation of the CBM DDG algorithm showed that in comparison to an external device, the measured respiratory waveforms, radiotracer quantification, and assessment of the presence of respiratory motion blur were similar, demonstrating that the CBM DDG algorithm holds promise as a replacement to external hardware devices currently needed to measure respiratory waveforms and hence could potentially simplify the data acquisition workflow. Finally, we found no statistically significant differences between the CBM and SS PET acquisition modes with respect to the regularity of respiratory waveforms, radiotracer quantification, contrast to noise ratio and perceptions of respiratory motion blur.

In conclusion, although no reductions of irregular breathing were found between CBM and SS, improvements in image quality through the use of EMC and reductions of workflow complexity through the use of DDG will hopefully facilitate the routine adoption of respiratory motion correction in PET/CT.

Advisory Committee:
Osama Mawlawi, Ph.D., Advisory Professor
Jeremy Erasmus, M.D.
Tinsu Pan, Ph.D.
Christine B. Peterson, Ph.D.
Richard Wendt, III, Ph.D.

Meier graduated in December and will begin residency at the University of Wisconsin-Madison.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

JEREMIAH SANDERS, PH.D.

Development of Fully Balanced SSFP and Computer Vision Applications for MRI-Assisted Radiosurgery (MARS)

Prostate cancer is the second most common cancer in men and the second-leading cause of cancer death in men. Brachytherapy is a highly effective treatment option for prostate cancer, and is the most cost-effective initial treatment among all other therapeutic options for low to intermediate risk patients of prostate cancer. In low-dose-rate (LDR) brachytherapy, verifying the location of the radioactive seeds within the prostate and in relation to critical normal structures after seed implantation is essential to ensuring positive treatment outcomes.

One current gap in knowledge is how to simultaneously image the prostate, surrounding anatomy, and radioactive seeds within the prostate after implantation for subsequent dosimetry using MRI. This would enable MRI to be used throughout the entire LDR prostate brachytherapy treatment workflow. A second gap in knowledge is how to accurately and automatically identify and localize the implanted radioactive seeds in the post-implant MRI. Such a technology would reduce the time and expertise required to perform seed localization for post-implant dosimetry. A third gap in knowledge is how to accurately and automatically contour the prostate and surrounding anatomy in the post-implant MRI, which would help streamline the process for performing post-implant dosimetry.

The research conducted attempts to fill the current gaps in knowledge by: (1) developing an MRI pulse sequence and acquisition protocol that enables high resolution and high SNR MRIs of the implanted radioactive seed markers, prostate, and surrounding anatomy with a single pulse sequence (using fully balanced steady-state free precession) and without an endorectal coil for post-implant quality assessment; (2) developing a computer vision technique for automatically identifying the implanted radioactive seeds in post-implant MRIs; and (3) developing a computer vision technique to automatically contour the prostate, rectum, seminal vesicles, external urinary sphincter, and bladder in post-implant MRIs. These developments would mitigate the uncertainties with the use of MRI in the post-implant setting, reduce the barriers for the utilization of MRI in post-implant quality assessment, reduce the time and resources required to perform post-implant quality assessment with precision, and help expand the access of MRI-assisted radiosurgery (MARS) for LDR prostate brachytherapy from major academic hospitals to the community setting.

Advisory Committee:
Jingfei Ma, Ph.D., Advisory Professor
Steven Frank, M.D.
David Fuentes, Ph.D.
Rajat Kudchadker, Ph.D.
Mark Pagel, Ph.D.
Arandhana Venkatesan, M.D.

Sanders graduated in the summer and started a fellowship with the Department of Imaging Physics at the University of Texas MD Anderson Cancer Center.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

KRISTINE L. FERRONE, PH.D.

Active Magnetic Radiation Shielding for Long-Duration Human Spaceflight

Exploration of interplanetary space presents significant hazards to human survival. Space radiation hazards outside the protection of the Earth's magnetosphere can produce both acute and chronic health risks and thus become limiting factors for NASA's planned mission to Mars by the 2030s. Radiation exposure on a Mars mission is delivered primarily by high energy heavy ions from galactic cosmic rays and moderate energy protons from solar particle events. The chronic radiation dose due to galactic cosmic rays on a typical Mars mission is on the order of 1 Sv, and additional acute radiation dose from solar flares can reach over 4 Sv, which is a potentially lethal dose. Hence radiation protection is a critical concern on these types of missions.

Various methods of radiation shielding have been proposed, from simple passive shielding via materials such as water, polyethylene, or aluminum, to active shielding systems comprised of electromagnetic fields. The concept of active magnetic shielding is to use high-temperature superconducting coils to induce very high magnetic fields around the spacecraft. The induced magnetic field will deflect incoming charged particles (solar particles and galactic cosmic rays), thereby reducing the particle flux and radiation dose to astronauts behind the shield.

This project developed a model for determining the value of active magnetic shielding in reducing radiation dose to astronauts on an interplanetary mission. This research includes Monte Carlo simulations to determine the effectiveness of magnetic shielding in decreasing effective dose to astronauts in a variety of mission scenarios. Dozens of permutations of mission type, mission duration, solar cycle, shielding configuration, magnetic field strength, crew gender, crew age, and phantom type were simulated in Geant4 to conduct a sensitivity analysis on the effect of varying each parameter on total crew effective dose for the mission.

Results indicate that magnetic shielding can reduce effective dose to astronauts on an interplanetary mission to within NASA's current limits, given a magnetic field strength of 7 T and/or advanced astronaut age. The detailed results serve to inform the human spaceflight community on the utility of active magnetic shielding as compared to passive or no shielding, based upon an end-to-end system model and comparison of several active magnetic shielding strategies.

Advisory Committee:
Stephen Kry, Ph.D., Advisory Professor
Fada Guan, Ph.D.
Jingfei Ma, Ph.D.
Leif Peterson, Ph.D.
Charles Willis, Ph.D.

Ferrone graduated this spring and is continuing her work at The Aerospace Corporation as Lead Scientist for Human Spaceflight within the Space Science Applications Laboratory.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

DANIELA BRANCO, PH.D.

Development of a CT Metal Artifact Management Algorithm for Proton Therapy Planning (AMPP) for Head and Neck Cancer Patients

Purpose: Dental amalgams (high Z materials) are common sources of artifacts in Head and Neck (HN) images. Commercial artifact reduction techniques have been offered, but many are impractical, produce inaccurate CT images or are not clinically available, thus not widely implemented. The goal of this work is to use CT gantry tilts to develop and evaluate a stereoscopic HN metal artifact management algorithm and investigate its improvement in proton treatment planning.

Methods: The in-house CT metal artifact management method for proton planning (AMPP) uses two angled CT scans to generate a single image set with no metal artifacts posterior to the dental metal implants. The algorithm was evaluated (geometrical distortion and HU accuracy) using a geometrical phantom simulating a HN patient with dental fillings. A H&N anthropomorphic phantom composed of proton tissue equivalent materials, human skull, air cavities was used to perform a quantitative image quality comparison between AMPP and four major CT vendors' commercial metal artifact reduction (MAR) solutions (OMAR from Philips, iMAR from Siemens, SEMAR from Canon, SmartMAR from GE), along with their implications on proton dose distributions.

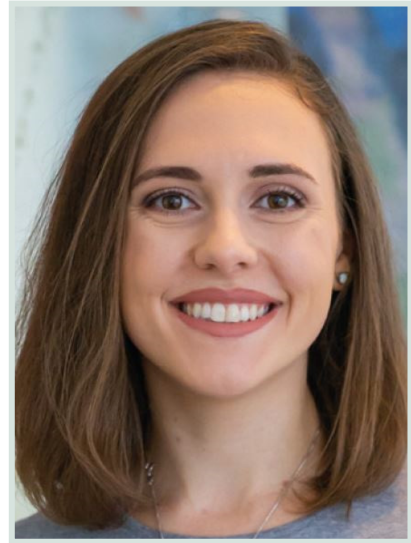
Results: The in-house algorithm designed produced geometrically and HU accurate images free of metal artifacts posterior to the HN region. AMPP outperformed all vendors' solutions in terms of image quality, showing lower HU differences and fewer bad pixels (4.2% compared to 25.5-65.5%). Dose distributions were negatively impacted by the presence of metal artifacts; the vendor solutions provided varying, but suboptimal, mitigation of this effect. Our in-house algorithm (AMPP) outperformed the vendor's solutions on all treatment plans and showed the most comparable DVHs to the baseline (no metal).

Conclusion: A novel in-house algorithm was designed that produces geometrically and HU accurate images free of CT metal artifacts posterior to the HN region. Commercial MAR algorithms were ineffective at reducing artifacts in a HN geometrical and anthropomorphic phantom scenario. Correspondingly, they were not successful at mitigating the impact of artifacts on proton dose distributions. Our in-house algorithm outperformed all four commercial vendor solutions in both imaging and dose distributions, and is ready to be implemented on patients.

Advisory Committee:
David S. Followill, Ph.D., Advisory Professor
Stephen F. Kry, Ph.D.
Paige A. Taylor, M.S.
John Rong, Ph.D.
Xiaodong Zhang, Ph.D.
Steven J. Frank, M.D.

Branco graduated this spring and has started a residency at the UC-San Diego.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.



MALLORY GLENN, PH.D.

Characterization of Treatment Planning System Photon Beam Modeling Errors in IROC Houston Phantom Irradiations

In radiation therapy, proper commissioning of the treatment planning system's (TPS) dose calculation algorithm is critical because any errors in this process impact all treatment plans prepared in the system. Previously, TPS errors have been identified as a major cause for poor phantom irradiation performance, which may also mean that patients are treated suboptimally. The purpose of this work was to investigate the TPS beam modeling developed by the radiotherapy community to understand where inconsistencies may arise, which variables are most susceptible to variations, and in what way changing these variables can alter dose calculations.

Using the Imaging and Radiation Oncology Core (IROC) Houston phantom credentialing framework, common observational characteristics among poor-performing phantoms were identified based on retrospective analyses of prior head and neck phantom performance. Next, treatment plan complexity, as defined by 16 different metrics, was considered and evaluated for relationships with treatment delivery accuracy for over 300 phantom irradiations. A survey was developed and deployed to the radiotherapy community to understand how institutions with similar linear accelerators (Linacs) establish their clinical beam models. From this survey information, a sensitivity analysis was completed on several head and neck phantom plans for parameters vi

modeling the multileaf collimator (MLC) characteristics in Eclipse and RayStation. Finally, previous phantom irradiation cases with concurrent survey results were investigated for relationships between beam modeling parameter choice and phantom performance accuracy.

The overwhelming majority of failing (>7% error) and poor performing (>5% error) irradiations were diagnosed as having systematic dose errors (>58% of cases). Treatment plan complexity was completely non-predictive of phantom performance (p>0.01, Bonferroni-corrected) and all correlations between complexity and performance accuracy were weak (less than ±0.30). The TPS beam modeling parameter survey generated 2818 responses from 642 institutions and revealed extensive variations in the modeling of MLC characteristics (leaf offset and transmission factor). These same parameters, namely Eclipse's dosimetric leaf gap and RayStation's MLC position offset, produced clinically significant dose changes when manipulated on 5 phantom treatment plans. Finally, the dosimetric leaf gap was associated with both poor-performing and failing phantom irradiations and correlated with TPS accuracy (r=0.397, p=0.048).

In conclusion, atypical beam modeling parameter values, specifically related to the representation of the MLC, are related to phantom performance and thus require careful attention in developing and performing quality assurance on the dose calculation.

Advisory Committee:
Stephen F. Kry, Ph.D., Advisory Professor
David S. Followill, Ph.D.
Rebecca M. Howell, Ph.D.
Julianne Pollard-Larkin, Ph.D.
Christine B. Peterson, Ph.D.

Glenn graduated in the spring and has started a residency with the University of Washington Medical Center in Seattle, Washington.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

JOSHUA P. GRAY, PH.D.

Directed Evolution of Cyclic Peptides for Inhibition of Autophagy

In recent decades it has become increasingly clear that induction of autophagy plays an important role in the development of treatment resistance and dormancy in many cancer types. Chloroquine (CQ) and hydroxychloroquine (HCQ), two autophagy inhibitors in clinical trials, suffer from poor pharmacokinetics and high toxicity at therapeutic dosages. This has prompted intense interest in the development of targeted autophagy inhibitors to re-sensitize disease to treatment with minimal impact on normal tissue. We utilized Scanning Unnatural Protease Resistant (SUPR) mRNA display to develop macrocyclic peptides targeting the autophagy protein LC3. The resulting peptides bound LC3A and LC3B—two essential components of the autophagosome maturation machinery—with mid-nanomolar affinities and disrupted protein-protein interactions (PPIs) between LC3 and its binding partners in vitro. LC3-binding SUPR peptides re-sensitized platinum-resistant ovarian cancer cells to cisplatin treatment and triggered accumulation of the adapter protein p62 suggesting decreased autophagic flux through successful disruption of LC3 PPIs in cell culture. In mouse models of metastatic ovarian cancer, treatment with LC3-binding SUPR peptides and carboplatin substantially reduced tumor growth after four weeks of treatment. These results indicate that SUPR peptide mRNA display can be used to develop cell-penetrating macrocyclic peptides that target and disrupt the intracellular PPIs that govern the autophagic machinery.

Advisory Committee:
Steven W. Millward, Ph.D., Advisory Professor
Robert C. Bast, M.D.
Pratip K. Bhattacharya, Ph.D.
Seth T. Gammon, Ph.D.
David R. Piwnica-Worms, Ph.D.
Richard E. Wendt, Ph.D.

Gray graduated in the summer and will be starting a postdoctoral position with the Department of Experimental Therapeutics at the University of Texas MD Anderson Cancer Center.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

MAUREEN ALIRU, PH.D.

Nuclear-Targeted Gold Nanoparticles Enhance the Effects of Radiation Therapy With and Without Liposomal Delivery

Less that 10% of pancreatic cancer patients are eligible for curative resection, and clinical trials evaluating chemoradiation in locally advanced patients with unresectable disease have been largely disappointing. New and creative therapeutic approaches are needed to address the unment need for treatment options. The objective of this thesis is to advance radiosensitization of treatment-resistant densely desmoplastic pancreatic cancer using nanoparticles to surmount biological barriers to effective particle distribution for DNA-targeting.

Clinical translation of radiosensitizing nanoparticles has stalled owing to technical challenges. Current strategies to use AuNPs for radiosensitization require large quantities of gold, kilovoltage x-rays, immediate irradiation after intravenous administration, and repetitive administrations of AuNPs prior to each radiation dose during a course of fractionated radiotherapy. To overcome these challenges, the next generation of AuNPs should be engineered with 2 design criteria: compatibility with multiple radiation platforms, and appropriate in vivo biodistribution for radiation dose enhancement at low gold quantities.

To address this, nuclear-targeted gold nanoparticles (nAuNPs) are developed as payloads for the thermosensitive liposomes (TSLs). The nAuNP-loaded liposomes are biocompatible carriers capable of penetrating the biophysical barriers and reach deep inside the tumor. Non-invasive thermal stimulation then releases the nanoparticle load at the intended of site of cellular uptake. The nuclear targeting of gold nanoparticles enhances the local effects of radiation via generation of short-range secondary electrons in the proximity of the DNA in aggressive cancer clones.

To test nAuNPs as a radiosensitizing payload of the TSLs, a three-phase plan is presented. Phase I focuses on AuNP cellular distribution, demonstrating signal specific nuclear localization. Phase II appraises radiosensitizing effects of nAuNPs in vitro.

Finally, Phase III demonstrates in vivo biodistribution and anti-tumor efficacy of the nAuNPS with and without TLSs in xenograft models of human pancreatic adenocarcinoma. This 3-phase study advances triggered-release of nuclear-targeted nanoparticles as a radiosensitizing modality for localized cancer therapy. This work provides a framework for the development of a readily deployable class solution for radiosensitization in a variety of tumors.

Advisory Committee:
Sunil Krishnan, M.D., Ph.D., Advisory Professor
Junjie Chen, Ph.D.
Sang Hyun Cho, Ph.D.
Konstantin Sokolov, Ph.D.
R. Jason Stafford, Ph.D.

Aliru graduated in the summer. She will be completing Medical School at UTHealth.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

TRAVIS C. SALZILLO, PH.D.

The Use of Magnetic Resonance Imaging and Spectroscopy to Interrogate the Metabolism of Brain Cancer and Associated Immune Cells throughout the Course of Tumor Progression

Rapid diagnosis and therapeutic monitoring of aggressive diseases such as glioblastoma (GBM) can improve patient survival by providing physicians the time to optimally deliver treatment. This includes early in development, while the tumor is still manageable, or following initial therapy, when alternative treatments should be considered. The main goal of this project was to determine whether metabolic imaging with hyperpolarized magnetic resonance spectroscopy (MRS) could detect changes in tumor progression more rapidly than conventional anatomic magnetic resonance imaging (MRI) in patient-derived GBM murine models. To comprehensively capture the dynamic nature of cancer metabolism, in vivo pyruvate-to-lactate conversion with hyperpolarized MRI, ex vivo metabolite pool size with nuclear magnetic resonance (NMR) spectroscopy, and ex vivo protein expression with immunohistochemistry (IHC) were measured at several time-points throughout tumor progression (tumor development, regression, and recurrence).

Hyperpolarized MRS was capable of detecting significant changes in pyruvate-to-lactate conversion throughout tumor progression whereas tumor volume measured with anatomic MRI was not significantly altered during regression or recurrence. This was accompanied by alterations in amino acid and phospholipid lipid metabolism and MCT1 expression. It is discussed how hyperpolarized MRS can help address clinical challenges such as identifying malignant disease prior to aggressive growth, differentiating pseudoprogression from true progression, quantifying treatment response, and predicting relapse. The individual evolution of these metabolic assays as well as their correlations with one another provides context for further academic research.

In addition to investigating GBM tumor progression, preliminary and supporting metabolic profiling data acquired with NMR spectroscopy is presented in the context of immunometabolism. Specifically, metabolic events associated with the licensing process of natural killer cells as well as macrophage polarization are analyzed. Collectively, this work demonstrates the value of interrogating the metabolism of GBM and tumor-associated immune cells with hyperpolarized MRS and NMR spectroscopy.

Advisory Committee:
Pratip Bhattacharya, Ph.D., Advisory Professor
John Hazle, Ph.D.
Frederick Lang, M.D.
Ho-Ling Anthony Liu, Ph.D.
Christopher Logothesis, M.D.
Richard Wendt III, Ph.D.

Salzillo graduated in the summer and will begin a residency with the Department of Radiation Physics at the University of Texas MD Anderson Cancer Center.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

KEITH A. MICHEL, PH.D.

Hyperpolarized Carbon-13 Magnetic Resonance Measurements of Tissue Perfusion and Metabolism

Hyperpolarized Magnetic Resonance Imaging (HP MRI) is an emerging modality that enables non-invasive interrogation of cells and tissues with unprecedented biochemical detail. This technology provides rapid imaging measurements of the activity of a small quantity of molecules with a strongly polarized magnetic moment. This polarization is created in a polarizer separate from the imaging magnet, and decays continuously towards a non-detectable thermal equilibrium once the imaging agent is removed from the polarizer and administered by intravenous injection. Specialized imaging strategies are therefore needed to extract as much information as possible from the HP signal during its limited lifetime.

In this work, we present innovative strategies for measurement of tissue perfusion and metabolism with HP MRI. These techniques include the capacity to sensitize the imaging signal to the diffusive motion of HP molecules, providing improved accuracy and reproducibility for assessment of agent uptake in tissue.

The proposed methods were evaluated in numerical simulations, implemented on a preclinical MRI system and validated in vivo in rodents through imaging of HP 13C urea. Using the simulation and imaging infrastructure developed in this work, established methods for encoding HP chemical signals were compared quantitatively. Lastly, our method was adapted for imaging of [2-13C]dihydroxyacetone, a novel HP agent that probes enzymatic flux through multiple biochemical pathways in vivo.

Our results demonstrate the capacity of HP MRI to measure tissue perfusion and metabolism in ways not possible with the imaging modalities currently available in the clinic. As the use of HP MRI advances in clinical investigations of human disease, these imaging measurements can offer real-time and individualized information on disease state for early detection and therapeutic guidance.

Advisory Committee:
James A. Bankson, Ph.D., Advisory Professor
John D. Hazle, Ph.D.
Arvind Rao, Ph.D.
R. Jason Stafford, Ph.D.
Aradhana Venkatesan, M.D.

Michel graduated in the summer and will be starting a fellowship in the Department of Imaging Physics at the University of Texas MD Anderson Cancer Center.

The following pages highlight dissertation and thesis abstracts for students who graduated since the last newsletter.

DAVID B. FLINT, PH.D.

The Importance of DNA Repair Capacity to (and a Model to Predict) Cell Radiosensitivity to Ions

Radiation therapy with ions has a number of advantages over conventional radiation therapy with photons, including favorable depth-dose distributions, greater relative biological effectiveness (RBE) and a lesser dependence on a number of biological factors known to affect radiosensitivity to photons, including DNA repair capacity. Thus, it is expected that an additional benefit of using ions is that they mitigate the great heterogeneities in treatment responses commonly observed in photon therapies.

However, by analyzing the cell survival of human cancer cell lines exposed to clinically relevant photon, proton, and carbon ion beams, we show there is not significantly less relative variability in intrinsic radiosensitivity between radiation qualities. These data imply that predicting intrinsic radiosensitivity – for which some research is underway for photon therapies – can provide similar benefits in the case of ion therapies in helping to mitigate heterogeneities in treatment response.

We also showed that there is no less variability in radiosensitivity between radiation qualities if the cells' DNA repair pathways are inhibited pharmacologically, which implies that DNA repair capacity remains relevant to determining intrinsic radiosensitivity, even for ions. We confirmed this fact by characterizing the survival of cell lines with differential DNA repair capacity exposed to photons, protons, helium and carbon ions, and by quantifying DNA repair by imaging immunohistochemically stained DNA repair proteins. We also showed that while non-homologous end joining repair is the more important DNA repair pathway, its importance relative to homologous recombination repair decreases with increasing ion linear energy transfer.

Finally, we created an empirical model to predict cellular radiosensitivity to ions on the basis of that cell's radiosensitivity to photons, and showed that this model can predict the response of cells with differing DNA repair capacity, whether naturally occurring, or induced by gene modification of pharmacological inhibition.

This work may be directly useful in the context of novel radiation therapies combined with DNA repair inhibition, as our work suggests that similar relative sensitization to ions as to photons can be achieved through DNA repair inhibition, and we present a model that can be used to predict ion radiosensitivity or RBEs in spite of this modulation.

Advisory Committee:
Gabriel Sawakuchi, Ph.D., Advisory Professor
Asaithamby Aroumougame, Ph.D.
Sang Hyun Cho, Ph.D.
David Grosshans, M.D., Ph.D.
Radhe Mohan, Ph.D.
Simona Shaitelman, M.D.
R. Jason Stafford, Ph.D.

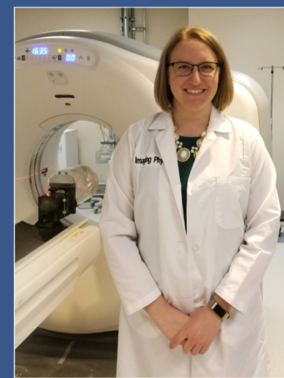
Flint graduated in the summer and will be starting a postdoctoral position in the Department of Radiation Physics at the University of Texas MD Anderson Cancer Center.

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 cash. Additionally, the graduate's name is engraved on the Aaron Blanchard Research Award in Medical Physics plaque that is displayed in the classroom.

2019 RECIPIENT
Megan Jacobsen, Ph.D.



Jacobsen received this award in recognition of her Ph.D. dissertation:

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

Her research with Dianna D. Cody, Ph.D., focused on improving differentiation of hemorrhagic and calcific intercranial lesions by utilizing dual-energy CT (DECT) and MRI quantitative susceptibility mapping (QSM) in both phantom and human imaging.

CONGRATULATIONS!

Past Blanchard Award Recipients

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, 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.

ELEVATOR SPEECH COMPETITION

Due to the pandemic, the wonderful scientific chaos that is GSBS Student Research Day (GSRD) was not be held in its usual format this year. Instead, 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.

ELEVATOR SPEECH COMPETITION

Saleh Ramezani
People's Choice Winner
Advisor: Mary C. Farach-Carson, Ph.D.

Do you know what a spelunker is? It is a person who climbs into the darkness of a cave to explore a wet dark place wearing a headlight. Like a spelunker, the gastroenterologist explores the dark reaches of the colon in search for colorectal lesions.

Colorectal cancer is the third leading cause of cancer related death in both men and women. But why isn't it detected earlier and removed? A major reason is that colonoscopy depends on actually being able to see the lesions in the colon with the naked eye. This means that cancer has been growing in the colon long enough for it to be visible, just like a stalagmite in a cave.

I'm Saleh, and I'm working with Drs. Farach-Carson, Harrington, and Bhattacharya to redefine colorectal cancer imaging. Our labs are developing an imaging tool that can detect the molecular signatures of colorectal cancer so that lesions can be detected much earlier than with traditional colonoscopy. Imagine the next time you go in for a colonoscopy, you can instead opt-in to take an MRI scan of your colon after receiving a contrast agent.

To develop these technologies, I have created a panel of cell-surface biomarkers that can be used to detect and colorize a variety of colorectal lesions. This is exciting because more sensitive and less invasive imaging techniques can be developed using a panel of biomarkers. So instead of spelunking blindly in the colon looking for large boulders, we can look for cellular signatures that identify malignant or pre-malignant lesions, detect colorectal cancer earlier than before, and save lives.

ELEVATOR SPEECH COMPETITION

Soleil Hernandez

Group 1: MS and Pre-Candidacy PhD Students, 2nd (tie) and People's Choice Winner

Advisor: Laurence E. Court, Ph.D.

Imagine that you're 7 years old, living in a low income country and you've just been diagnosed with a brain tumor Except, because of where you were born, you don't have access to the proper resources that you need to fight it.

One of these key resources, being high quality radiation therapy. Now to understand the complexity of this treatment let me talk you through what it takes to get to treatment.

So, we start with a CT scan. And you can think of this like a blueprint. But rather than outlining and color coding rooms in a building, we're outlining and color coding organs in your body. And we do this so that we can understand how much radiation will be delivered to each of these organs. We then use this information to create a step by step instruction guide that tells the machine exactly how to orient each beam to deliver the radiation the way we want it to.

Now this entire process is complex and time-consuming. So what's a PhD student to do to make it faster? Hi, I'm Soleil Hernandez and my lab's answer to this question is artificial intelligence.

Now in the same way that snapchat can take this picture of my advisor, automatically recognize facial features, and apply fun filters, we've taught a computer how to take a CT scan, automatically recognize and outline organs and create a step by step instruction guide.

This lets a physician from anywhere around the world send us a CT scan and we'll return a completed treatment plan.
This will increase global access to high-quality radiation therapy that we have right here in the United States.

Because cancer doesn't discriminate and neither should the resources needed to fight it.

ELEVATOR SPEECH COMPETITION

When we take medication, we take a specific dose. Taking less delays healing, while taking more causes more harm than good. Radiation therapy for cancer treatment works the same way, by prescription! The doctor prescribes a dose of radiation to a tumor which is delivered by a beam from a therapy machine.

Tests have shown that at cancer centers across the US, 15% of radiation doses are either too much or too little compared to the prescription. Many steps are involved in the treatment process, and so these incorrect doses could be caused by several errors which have not yet been specifically identified.

My project aims to isolate the steps involved from prescription to treatment and identify the errors present at each step. We will use data collected from all these cancer centers to perform quantitative analysis, to determine how significantly each error contributes to incorrect treatment.

We've already identified 4 major errors and are working to quantify their effects. Our results will provide knowledge needed to develop targeted solutions to improve the quality of radiation treatments for cancer patients nationwide.

I am Sharbacha Edward, a 3rd year Medical Physics student in the lab of Dr. Kry, and my mission is radiation prescription rectification!

Sharbacha Edward

Group 2: Post-Candidacy PhD Students

2nd Place Winner

Advisor: Stephen F. Kry, Ph.D.

ALUMNI NEWS

S. Cheenu Kappadath, Ph.D. was honored at the August 8, 2019 President's Recognition of a Faculty Excellence Awards, hosted by Dr. Peter Pisters

Konsantin Sokolov, Ph.D. was honored as a new member of the Academy of Radiology and Biomedical Imaging Research Council of Distinguished Investigators

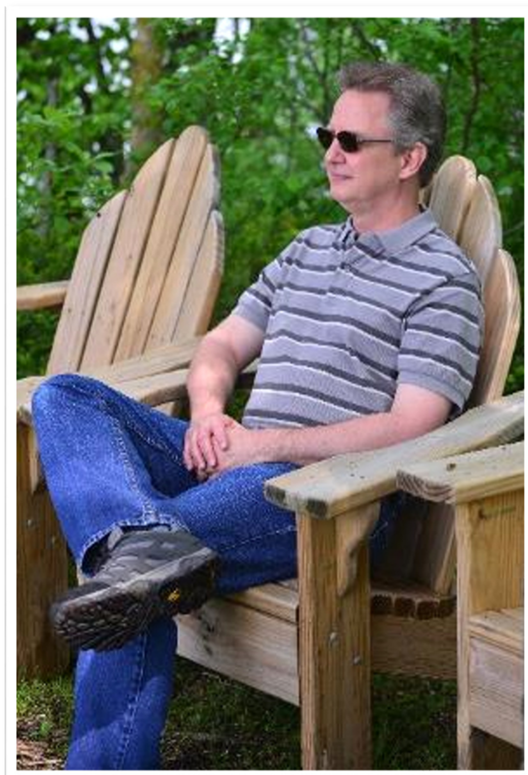
In Memoriam

Dr. Edward Jackson

By John D. Hazle, Ph.D.
Professor and Chair, Department of Imaging Physics

It is with a heavy heart that we learned of Dr. Ed Jackson's passing on Tuesday, June 2, 2020.

Ed and I met as "lab mates" in 1986 and toiled together, side-by-side, for three years developing technologies and techniques for experimental MR imaging. In 1993, Ed joined me at MD Anderson to begin the journey of developing the Department of Imaging Physics. We worked together for 20 years, again side-by-side with him as Deputy Chair, until 2013 when Ed left to become the Chairman of Medical Physics at the University of Wisconsin. For those that don't know, UW is considered to be the best academically oriented medical physics department in the world. Prior Chairs of that department are all internationally recognized and, until Ed, UW graduates. Ed took a great department and made it even better. He not only impacted Medical Physics at UW, but to quote Medical School Dean Robert Golden, "I am continuously impressed with Dr. Jackson's capacity to blend his commitment to excellence with the very best human qualities of warmth, encouragement and collegiality. He is my "go to" person when I need a thoughtful, bright leader who will take on important and demanding leadership challenges…"



Ed was a 1984 graduate of Auburn University – War Eagle – finishing his MS in physics there in 1985 before matriculating to the Medical Physics program at MD Anderson/UT Health Graduate School of Biomedical Sciences (GSBS). He finished his Ph.D. at the GSBS in 1990 and joined the faculty of Radiology at UT Health that year. In 1993, Ed joined Jeff Shepard and me as the "three amigos" in the Radiological Physics Section of the Department of Diagnostic Radiology here at MD Anderson. With Division Head Dr. Bill Murphy's support, we set out with the goal of developing the best imaging physics program in the world. In that quest, Ed was tireless and relentless. He made sure that we achieved every goal we set out to perfection. In visionary leadership style, Ed did this with the highest standards of collegiality and humanity. He never asked anyone to do more than he was willing to shoulder, and he was always there to lend a hand to those struggling to meet our expectations.

Ed's impact at MD Anderson extended far beyond Imaging Physics and Diagnostic Imaging. He was a key member of the team that developed the BrainSuite that sited an MR scanner in neurosurgery.

Continued on next page

Ed's commitment to patient and staff safety is exemplified by the fact that the polices and procedures he developed, and the effort he expended in educating the surgical staff about MR, have resulted in no significant safety events in over 11 years of operating an MR scanner near sharp objects. Further, his stature among his MD Anderson faculty peers was demonstrated with his election as Faculty Senate Chair-elect in 2009 and to Chair in 2010.

Ed's academic and professional accomplishments were numerous, so I'll highlight just a few. He was very involved in the American Association of Physicists in Medicine, Radiological Society of North America, American College of Radiology and the International Society of Magnetic Resonance in Medicine. He had leadership roles in all these organizations, largely focused on the quantification of MR data, and specifically dynamic contrast-enhanced MR. Through many peer-reviewed publications and grants, Ed's recognition in this field grew. He was internationally considered an expert. Perhaps the ultimate recognition of this stature was his selection as Chair of the RSNA Quantitative Imaging Biomarkers Alliance (QIBAÒ) in 2015 (he also served as Vice Chair from 2012-2015).

But Ed's true passion, and the one that he has asked people contribute to in his memory, was graduate education. Ed was the Deputy Director of the GSBS Program in Medical Physics from 1999-2004. In 2004, he assumed the role of Director, a role in which he contributed *blood, sweat and tears* until his departure for UW in 2013. At UW, Ed assumed the role of graduate program Director and passionately carried out that role, along with being Chair of a faculty of about 40, until he stepped down from both earlier this year. Examples of Ed's commitment and recognized excellence in education was his election to The University of Texas Academy of Health Science Education in 2012 and his selection as President of the Commission for the Accreditation of Medical Physics Educational Programs (CAMPEP) from 2016-2018.

These are just a few of Ed's accomplishments. But those were just the part of Ed we saw daily. Ed was a devout family man. His commitment to his wife Sondra and children Michelle and Jonathan was unwavering. He spoke of them often and with the greatest pride imaginable. But Ed treated everyone like family, with compassion, humility and respect. He was an exceptional human being in every way. His passing is a loss for everyone who knew him, and for many more who didn't have the honor of knowing him…

Ed's family is holding a private ceremony before his cremation in Madison. The University of Wisconsin will hold a celebration of his life later in the year, and we plan to do the same here.

In lieu of flowers, Ed asked that we support his passion – the Medical Physics graduate program. Contributions may be made to The University of Texas MD Anderson Cancer Center, Dr. Edward Jackson Endowment Fund, P.O. Box 4486, Houston, TX 77210-4486 or at mdanderson.org/gifts.

In Memoriam

Dr. Edward Jackson

By Ken Hogstrom, Ph.D.
Professor Emeritus, LSU, and
Past-Chair, Department of Radiation Physics,
MDACC

I believe each of us was put on this earth to serve humanity, and Ed Jackson not only had a special charge, but achieved it in a highly professional and caring manner. In the mid 1980s, The University of Texas M D Anderson Cancer Center began a restructuring of its medical physics programs, and over time Ed proved to be a key contributor to the success of that process. During that period, I first taught Ed, a student, in a few courses, quickly appreciating his knowledge of physics, understanding of medical physics, research abilities, leadership qualities, and humility. Ed was exemplary, producing many journal publications and receiving multiple awards and for his dissertation research under Dr. Pan Narayana.

After graduation, Ed joined forces with Dr. John Hazle in pioneering the Department of Imaging Physics into one of the premier academic imaging physics departments in our field. Starting from scratch required considerable work to develop an academic department synergistically committed to patient care, education, and research, such breadth a long-time hallmark of MDACC. Ed was a major force in that achievement, as detailed in Dr. Hazle's tribute.

Ed was an accomplished educator, particularly in our graduate program. First as a faculty instructor and graduate student mentor, then as deputy program director, and later as program director. Whether lecturing, mentoring, serving on graduate committees, or providing leadership, his contributions were exemplary and helped elevate the program to one highly sought by incoming students and whose graduates were highly sought by medical physics programs. Ed's participation and leadership also fostered growth of medical physics education outside MDACC, through his AAPM and CAMPEP efforts. His accomplishments were no better exemplified than by his being awarded the prestigious MDACC Randolph Hearst Foundations Faculty Achievement Award in Education in 2007.

We will all miss Ed's smile and comradery, although his spirit and presence can still be experienced through our memories and the examples he set for all medical physicists. My heart goes out to his family, friends, and colleagues, and I hope all will join me in remembering his legacy by contributing to the fund set up in his memory in the medical physics graduate program to which he was so devoted.

UTGSBS-MDACC program graduates at Dr. Hogstrom's house, 1991 (L-R): Greg Dominiak, Mike Moyers, Ed Jackson, and Scott Jones

In Memoriam

Dr. Edward Jackson

By Richard Wendt, Ph.D.
Professor

I still recall my first meeting Ed in the tiny little inner office space in B2.4319 in 1996, when he interviewed me to become the fifth member of the group that was to grow into the Department of Imaging Physics. It was not long before the floors had been renumbered and Ed had moved into a much nicer office down the hall. Although he liked to keep it dimly lit, Ed himself was a bright light of medical physics.

Ed created a model of physics involvement in the clinic that persists to this day. He made medical physicists partners and integral participants in the care of the patients who received MR examinations.

Ed was a paragon of virtue. He was absolutely trustworthy and reliable. He could be critical when criticism was warranted, but it was never unkind. He did not gossip or impute motivation. Even in trying circumstances, he was concerned only with the facts and solving the problem. The files of the Medical Physics Program document several instances in which Ed's wisdom and intrinsic good nature brought about the best possible outcome in a difficult situation. Ed patiently helped me come up to speed as his successor in directing the graduate program, and he was generous with his wise counsel even years after his departure for Wisconsin. Ed was positive, and his outlook was both infectious and inspiring. One might not guess that from the black background of his trademark slide template or his penchant for dark shirts, but he was.

His students loved him. The skeleton that they dressed up in his lab coat still stands in the corner of the classroom even though the last student who was recruited while Ed was director defended his dissertation this past June.

Ed was amazingly well-organized and efficient. He would still be working on things and writing Email in the wee hours of the morning. It seemed as if he never slept or wanted for energy. It is a good thing that MD Anderson does not have a pedestrian speed limit or Ed would have received a stack of tickets. While Ed departed this earth at too young of an age, he lived more life in those years than most do in many more. The world is a better place for his having been in it.

I miss him.

Radiation Physics
Residency Program

INCOMING FELLOWS AND RESIDENTS

The Residency Program will welcome four residents on September 1, 2020.

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

Irwind Tendler, Ph.D.
Dartmouth College

Sara Thrower, Ph.D.
MD Anderson UT Health Graduate School

Marissa Vaccarelli, M.S.
Hofstra University

Mohammad R. Salehpour, Ph.D., DABR
Program Director

Radiation Physics

Residency Program

RECENT GRADUATES

Four residents will complete the program on August 31, 2020

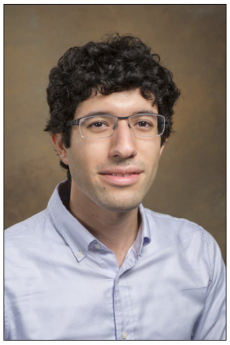
Manik Aima, Ph.D.
(University of Wisconsin-Madison) is currently interviewing

Garrett Baltz, Ph.D.
(MD Anderson UT Health Graduate School) will be joining the Scripps MD Anderson Cancer Center in San Diego, California as a Radiation Physicist

Parmeswaran Diagaradjane, Ph.D.
(Anna University) is currently interviewing

Christopher M. Peeler, Ph.D.
(MD Anderson UT Health Graduate School) is currently interviewing

CURRENT FELLOWS AND RESIDENTS



Fahed Alsanea, Ph.D.
MD Anderson UT Health Graduate School

Yvonne Roed, Ph.D.
University of Houston

Joshua Niedzielski, Ph.D.
MD Anderson UT Health Graduate School

IMAGING PHYSICS

Residency Program

INCOMING FELLOWS

The Residency Program welcomes its newest fellows, Jeremiah Sanders and Keith Michel. Sanders and Michel will begin their residencies this summer.

Jeremiah Sanders, Ph.D.
MD Anderson Cancer Center
UT Health Graduate School

Keith Michel, Ph.D.
MD Anderson Cancer Center
UT Health Graduate School

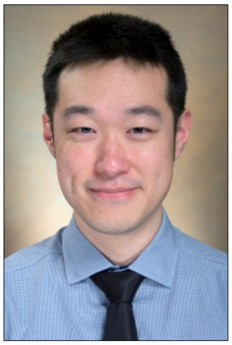
Ho-Ling Anthony Liu, Ph.D.
Program Director

Imaging Physics
Residency Program

RECENT GRADUATE

The Residency Program bade farewell to Christopher M. Walker, Ph.D. as he completed the Program. Walker is now at MD Anderson Cancer Center where he is working as an assistant professor in the Department of Imaging Physics.

CURRENT FELLOWS

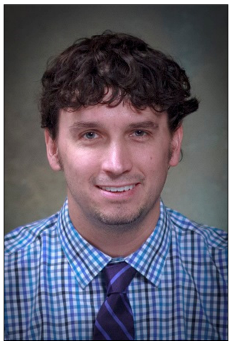


Henry Chen, Ph.D.
University of British Columbia

Megan Jacobsen, Ph.D.
MD Anderson UT Health Graduate School

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

Drew Mitchell, Ph.D.
MD Anderson UT Health Graduate School



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

SHALEK FELLOWSHIP APPEAL

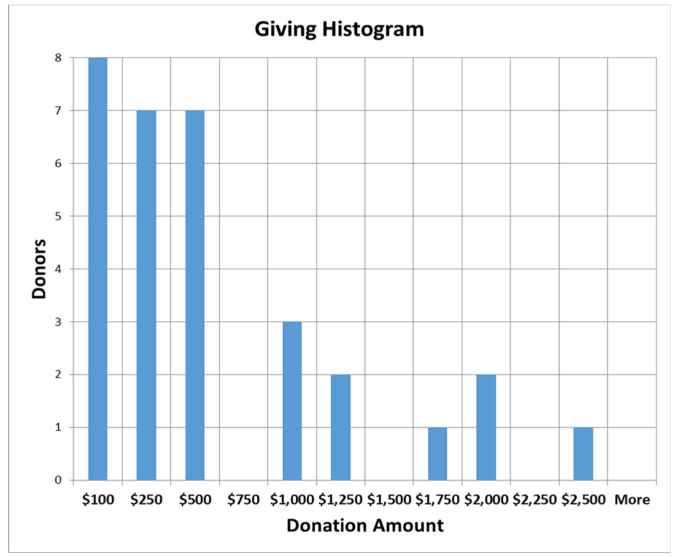
The 2019-2020 Shalek Fellowship appeal raised a total of $33,850 for the support of students in the Graduate Program in Medical Physics of The University of Texas MD Anderson Cancer Center UTHealth Graduate School of Biomedical Sciences. We met the goal of our anonymous donor and matched that $15,000 challenge. The program is grateful for all of the support that you have offered to our students. Both the number and the amount of your gifts grew from past years. Again, thank you. With your support, the program is able to fund the tuition, fees, health insurance and a stipend for our only incoming SMS student in the entering class of 2020, Hayden Scott. Our program is so strong because of your loyal and generous support.

Another measure of the strength of our program is our success in recruiting students. This year, we had a 50% acceptance rate of our SMS offers of admission and a 100% acceptance rate of our PhD offers. The only one who got away is going to the University of Wisconsin. Hayden will be joined by eight new PhD students this coming August. Five of them will initially be funded by the GSBS, one by the Department of Radiation Physics, and one by a faculty member, while one is self-funded.

As the world faces an uncertain future at the present time, we are continuing to teach medical physics as best as we can through on-line lectures and using online demonstrations in lieu of hands-on labs. As I write, our more senior students are slowly making their ways back into the laboratories in addition to conducting the research that they have been able to perform remotely. We have had ten dissertation defenses this spring and summer that have been fabulously well attended, thanks to the online presentations of the public seminars. It goes almost without saying that our newest graduates' work is as impressive as ever.

I hope that you will be able to support the 2020-2021 Shalek Fellowship appeal next fall and that we can sustain the level of support that you have offered to our students. Again, thanks.

Bud Wendt
Program Director



FY20 Shalek Donations to date

Grand Total		$33,850
Matching challenge		$15,000
Regular gifts		$18,850
Median		$300
Mean		$608
Mode		$100
Donors		31
	PhD Alumni	12
	MS Alumni	6
	Faculty	3
	Former Faculty	4
	Other Friends	3

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.

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
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