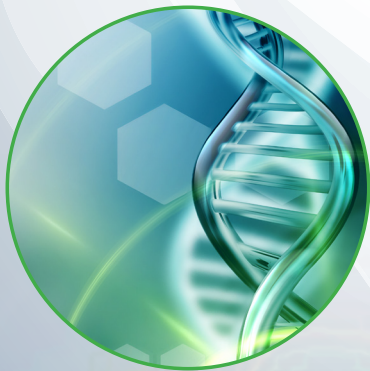


The American Association *of* Physicists in Medicine



focus on our future

2016
ANNUAL REPORT



AAPM

Education & Research Fund Annual Report 2016

The AAPM Education & Research Fund supports the development of our great profession via the provision of seed money for research, fellowships for Ph.D. students, support for clinical residencies, and our Future Graduate Program, which provides additional funding for Summer Undergraduate Fellowships and the Diversity Recruitment through Education and Mentoring (DREAM) program. Without contributions from our generous members we would never have been able to provide the now over 100 grants, fellowships and residencies since the inception of the Fund over 20 years ago. As always, AAPM is extremely grateful for the generous gifts from our members.

Thanks mainly to our Five-Year Pledge Program initiated in December 2015, for which AAPM provides matching funds, and some very generous donations to establish the Lech Papiez Memorial Fund, we saw a 45% increase in donations to support our educational and research efforts in 2016. We are especially grateful to the 30 members who are participating in the Five-Year Pledge program. They donated over \$20,000 in 2016, with matching funds from the AAPM, which will, of course, reflect continued support over the next several years.

The Education & Research Fund also tracks funding for awards coming from within AAPM Councils and Committees, as well as support from outside organizations. The following awards were funded through such sources in 2016:

- The Education & Training of Medical Physicists Committee (ETC) of the Education Council funded \$50,000 to support 10 Summer Undergraduate Fellowships and \$20,000 to support four DREAM program grants. Three additional Summer Undergraduate Fellowships were funded through generous contributions from the AAPM Delaware Valley Chapter, AAPM North Central Chapter and the AAPM Northwest Chapter.
- Science Council, under the sponsorship of the Research Committee, funded \$75,000 to support three research seed grants to new researchers in the field.
- AAPM awarded six scholarships to the Summer School at \$795 each.
- AAPM and RSNA each provided \$280,000 to support eight Commission on Accreditation of Medical Physics Educational Programs (CAMPEP) accredited

imaging physics residencies in 2016. Each institution receives \$35,000 per year for four years in matching support for two residents.

- AAPM (through the Educational Council) and the Society of Nuclear Medicine and Molecular Imaging provided \$35,000 (25% support) each in 2016 to fund two two-year nuclear medicine residency programs to support a total of two residents. Each funded institution provided \$70,000 (50% support).

The Education & Research Fund independently funds two annual awards of \$18,000 each. These grants are the AAPM Fellowship in Medical Physics and the AAPM/RSNA Fellowship in Imaging Medical Physics.

The benevolence of our members is greatly appreciated and AAPM is proud to include the following testimonials from the recipients of our 2016 awards programs. These demonstrate the enormous value the recipients place on the significance of this support. Please read through the reports from the recipients to learn how the monies from the Education & Research Fund are aiding in the development of their careers.

2016 REVIEW

Grants & Fellowships

THE RESEARCH SEED FUNDING GRANT



Andrea Ferrero

Mayo Clinic, Rochester, MN

“The AAPM seed funding grant that I was awarded in the spring of 2016 has enabled me to protect time during my residency to complete this investigation.”

More importantly, it has greatly facilitated the *in vivo* validation of

the research project, allowing me to connect with leading urologists in my clinical practice through invited talks and seminars, sparking their interest in the proposed methods and initiating collaborations that are proving invaluable. The funding itself allowed me to dedicate resources like research technologist time to the sample preparation, image acquisition and processing.



Fada Guan

University of Texas MD Anderson Cancer Center, Houston, TX

“The preliminary data generated in this project has been used in an NIH R01 grant application, and the new results will be presented in the forthcoming AAPM Annual Meeting.”

My sincerest thanks go to the American Association of Physicists in Medicine for providing the Research Seed Funding Initiative Award to support my research characterizing the biologic response of therapeutic protons at the cellular and DNA level in terms of their physical interactions. The grant has been used to construct the infrastructure of my research by establishing a super-fast Monte Carlo computation and visualization platform to design the radiobiological experiments. The funds have also been utilized for purchasing the equipment and supplies for performing the cell irradiation experiments to quantify the DNA damage.

Yoann Petibon

Massachusetts General Hospital, Boston, MA

“The AAPM funds have been essential to carrying out this research.”

The goal of this AAPM-funded project is to develop novel quantitative PET-MR methods geared towards improving the quality of coronary 18F-fluoride (18F-NaF) PET imaging. Coronary atherosclerotic plaque rupture is the main cause of myocardial infarction. Recent studies have shown that active microcalcification in the coronary arteries, one of the hallmarks of plaques at risk of rupture, can be imaged using 18F-NaF PET. However, visualization and quantification of coronary 18F-NaF uptake using PET is very challenging due to the motion of coronary arteries. Recently, hybrid PET-MR scanners have become available, offering unparalleled opportunities for imaging coronary plaques. Indeed, anatomic information obtained from simultaneously acquired, co-registered MR data has the potential to significantly improve coronary PET image quality via MR-based motion correction of PET data. We have successfully developed a novel PET and MR data acquisition and processing pipeline enabling motion-compensated coronary 18F-NaF PET imaging while preserving sensitivity. We have so far tested our methods in three patients. Early results suggest that our methods yield PET images with improved resolution and quality as compared to conventional methods.

We are currently working on drafting an abstract for submission to the 2017 AAPM Annual Meeting.

AAPM/RSNA IMAGING PHYSICS RESIDENCY GRANTS

UNIVERSITY OF ALABAMA AT BIRMINGHAM

Program Director: Sharon L. White



A two-year fellowship program in diagnostic imaging medical physics was initiated in 1978 at UAB. Now a residency program, trainees participate in clinical support, teaching and clinical research projects as training for a career in diagnostic imaging medical physics. Training is provided in all areas of diagnostic

imaging including general x-ray, fluoroscopy, CT, MRI, nuclear medicine, PET, and informatics. Our residency is now CAMPEP accredited and currently has two residents: **Ramses Herrera** expected to complete residency April, 2018 and **Daniel Vergara** expected to complete residency July, 2018.

UNIVERSITY OF WISCONSIN

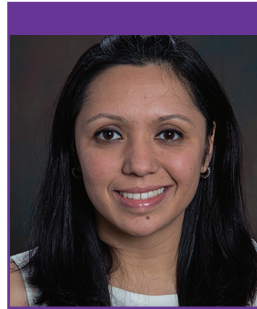
Program Director: Frank N. Ranallo



Our residency is now CAMPEP accredited and currently has two residents: **Zhimin Li (Jimmy)** expected to complete residency March 31, 2018 and **Christina Brunquell** expected to complete residency June 30, 2018.

EMORY UNIVERSITY

Program Director: J. Nye



Our residency is now CAMPEP accredited. We currently have two residents supported by the grants: **Nicole Ball** who started her residency in July 2016, and **Shalmali Dharmashikari** who will complete her residency on June 30th, 2017.

INDIANA UNIVERSITY

Program Director: Y. Liang

Our two-year residency program in diagnostic imaging medical physics is designed to provide clinical imaging physics training in areas of clinical quality assurance, clinical research and teaching. The program is administrated by the Department of Radiology within Indiana University School of Medicine (IUSM). The key characteristics of our program include the extensive leverage of resources from the IUSM/IU Health Partnership and their large clinical care, basic science and clinical research programs. We are at the final stage of completing our self-study documentation for CAMPEP application.

We currently have three residents:

Vijay Rana, PhD has gone through the first round of clinical rotations on Digital Radiographic, Fluoroscopy, Computed Tomography, Ultrasound and Interventional Angiography. He is currently on MRI rotation. He passed the ABR Part 1 Exam in August 2012.

Xuandong Zhao, PhD has completed clinical rotations on Digital Radiographic, Fluoroscopy, Computed Tomography, Ultrasound and Magnetic Resonance. He is currently on Mammography rotation. He passed the ABR Part 1 Exam in August 2016.

Yauheni Rudzevich, PhD has gone through the first round of clinical rotations on Digital Radiographic, Fluoroscopy, Computed Tomography, Ultrasound and Magnetic Resonance. He is currently on Mammography rotation. He passed the ABR Part 1 Exam in August 2016.

MEMORIAL SLOAN KETTERING CANCER CENTER

Program Director: L. Rothenberg

Our program at MSKCC is a four-year program in which those accepted perform research for the first two years as postdoctoral research fellows and then receive clinical training as imaging physics residents for the next two years. Our residency is now CAMPEP accredited. We currently have four residents:

Milan Grkovski, PhD started on August 26, 2013 and worked on a project entitled "Prognostic value of tumor hypoxia, as measured by 18F-FMISO breath hold PET/CT, in non-small-cell-lung cancer (NSCLC) patients" under the direction of Drs. Sadek Nehmeh and John Humm. He made an oral presentation at the 2014 RAMPS Vacirca Young Investigator Symposium and at the 2014 SNMMI Annual Meeting. He submitted two abstracts which were accepted for oral presentation at the 2015 SNMMI Annual Meeting and one abstract for the 2015 AAPM Annual Meeting. Dr. Grkovski will graduate in late Summer 2017.

Edward K. Fung, PhD started on November 18, 2013 and worked on a project entitled "Compartmental modeling of PET radiolabeled antibody uptake in tumors" under the direction of Drs. John Humm and Pat Zanzonico. Dr. Fung made oral presentations at the 2014 AAPM Annual Meeting, at the 2014 RAMPS Vacirca Young Investigator Symposium, and at the 2015 World Molecular Imaging Conference. He has submitted an abstract for presentation at the WMIC 2016, and has an oral presentation accepted at SNMMI 2016. Dr. Fung will graduate in Winter 2016-17.

Sang Ho Lee, PhD started on September 16, 2015 and is working on a project entitled "MRI metrics to predict and monitor therapy response in mesothelioma and non-small cell lung cancer" under the direction of Dr. Neelam Tyagi. He made oral presentations at the 2016 RAMPS Vacirca Young Investigator Symposium and subsequently at the 2016 AAPM Annual Meeting. In 2017, Dr. Lee has submitted an abstract for the 2017 AAPM Annual Meeting, which was accepted for an oral presentation within the regular scientific program as well as the best in physics poster discussion. He has also submitted another abstract for presentation at the ASTRO 2017. He received the MSK Society Scholars Prize to honor his scientific accomplishments. Dr. Lee will begin full-time clinical training in September 2017.

Louise Fanchon, PhD started on May 15, 2016, and is working on bio-distribution of various pancreatic cancer drugs and of drugs encapsulated in a novel type of nanoparticles under the direction of Dr. John Humm and Dr. James Russell.

DUKE UNIVERSITY

Program Director: Ehsan Samei

The objective of the Imaging Physics Residency program at Duke University Medical Center is to produce an independent practitioner in the physics of diagnostic imaging who is a lifelong learner and who can work unsupervised at a safe and highly professional standard.

The program maintains a level of training, through periodic self-evaluation by both residents and mentors/staff, adequate to enable resident physicists to reach a level of competence sufficient to perform all aspects of routine diagnostic imaging tasks and to contribute to safe and accurate imaging procedures. In addition, the training prepares the resident to perform other aspects of an imaging physicist's responsibilities including teaching, research, radiation safety, and administration.



Yakun Zhang entered the program in October 2013, and successfully completed the Duke Imaging Physics Residency Program in October 2016. Yakun has provided numerous contributions not only for our Duke clinical operations, but many of her efforts resulted in national impact. Yakun's accomplishments include two first

author and two co-authored peer review publications, as well as four first author and two co-author conference oral presentations. Yakun's contribution to Duke's clinical operation include the development of an MR RF coil QC program, an automated daily QC program for CT for analyzing noise texture, and a GUI tool used for CT protocol optimization, as well as taking on several teaching responsibilities for medical physics students and radiology residents. Yakun is also heavily involved on a national level in the RSNA QIBA initiative to assess variability in CT scanners across the US. After graduating, Yakun secured a full time staff physicist position with the Duke Clinical Imaging Physics Group where she will undoubtedly continue to provide a positive impact to the field of medical physics.



Tamar Chighvinadze entered the Duke Imaging Physics Residency Program in September 2015. During 2016 Tamar's clinical rotations included mammography, MRI and General Radiography. Tamar's contributions to Duke's clinical operation include conducting an internal audit of the field strength of screening magnets, developed a method for performing transmission coefficient calculations of radiography wall and table buckys, and created educational material on B1+rms for MRI technologists. Tamar also become an MQSA qualified physicist for FFDM and tomosynthesis mammography units.

UNIVERSITY OF OKLAHOMA

Program Director: Jagadeesh Sonnad
Joshua McIlvain, MS, 2nd year



Erin France, MS, 1st year

Our CAMPEP accreditation was approved in November 2016 and the initial approval goes to December 2019 and automatic extension, with completion of annual reports, to December 31, 2021.

Diagnostic Imaging Physics Residency Program, DIPRP, participated in the CAP with 27 applicants for 2017 and we selected Mr. Raman Rana to begin his training in July 2017.

AAPM GRADUATE FELLOWSHIP



Rebecca Meerschaert
 Wayne State University, Detroit

“I can say unequivocally that this fellowship opened many doors for me and directly enhanced my professional development in many ways that cannot be quantified.”

The AAPM Graduate Fellowship provided me an incredible opportunity to participate in medical physics research

at Wayne State University through the Karmanos Cancer Institute. Not only have I learned an immense amount conducting my own research, I also gained invaluable hands-on experience working with patient treatment plans. During this fellowship, I conducted research under my mentor Dr. Zhuang, relating to adaptive radiotherapy for cervical cancer patients. We investigated the variations of manual organ delineation during the multi-fractionation HDR brachytherapy of cervical cancer treatment, as published in JACMP. The presence of internal organ motion makes cervical cancer a clear candidate treatment site for adaptive strategy. By creating a program to rigidly register CT images from each HDR brachytherapy fraction and perform similarity calculations (Hausdorff distances, Dice Similarity Coefficients, etc.), I was able to analyze the extent of organ variations and relate them to dosimetric variations. Our current studies involve comparing multiple deformable image registration (DIR) algorithms including intensity-based and mesh-based techniques. By incorporating DIR to our study, we can further understand organ motion in the pelvis and have the ability to perform auto-segmentation for treatment planning. Through improved understanding of pelvic organ motion and incorporating adaptive radiotherapy, we can optimize treatment planning and outcomes, in addition to limiting labor-intensiveness and inter-observer/intra-observer variability during the treatment planning process.

This fellowship has led to many rewarding opportunities, including multiple peer-reviewed publications and presenting various talks about our research at AAPM's Annual Meeting. I am motivated and eager to continue my research under Dr. Zhuang and Dr. Burmeister during the remainder of my graduate studies. This fellowship and the mentoring I received have helped me find a project on a topic and field that I am very passionate about.

I am very grateful to have been chosen as an AAPM Graduate fellow.

AAPM/SNMMI NUCLEAR MEDICINE RESIDENCY GRANTS

SUNY, STONY BROOK, NY

Program Director: Terry Button

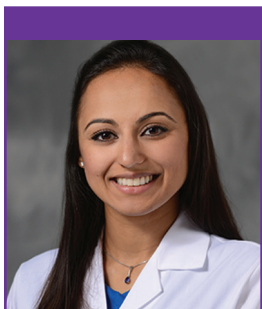


Our resident is **James Scheuermann** who has an MS in Physics, as well as an MS in Medical Physics from our CAMPEP accredited program and is scheduled to defend his doctoral dissertation shortly. Finally, James was the First-Place winner of the 2016 AAPM John R. Cameron Young Investigators Competition. Clearly, he will be an outstanding

Medical Physics Resident and will impact the practice of Medical Physics into the future!

HENRY FORD HOSPITAL, DETROIT MI

Program Director: Beth A. Harkness



Our resident is **Joshi Sonal** who started her dedicated nuclear medicine training year on July 1, 2016. Since that time, Sonal has spent her time working with Beth Harkness, MS and Matt Vanderhoek, PhD in all aspects of nuclear medicine physics support at Henry Ford Health System. This includes but certainly is not limited

to annual testing, monitoring the quality control program, protocol review, Y-90 TheraSphere therapies and dosimetry. During this time we have purchased a CZT imaging device which Sonal was instrumental in evaluating due to her extensive knowledge of CZT detectors. Sonal plans on taking the American Board of Science in Nuclear Medicine exam and then proceeding to take the ABR exam this summer.

AAPM/RSNA FELLOWSHIP FOR THE TRAINING OF DOCTORAL CANDIDATES IN THE FIELD OF MEDICAL PHYSICS

Dylan Breitkreutz

University of Alberta
(Cross Cancer Institute)



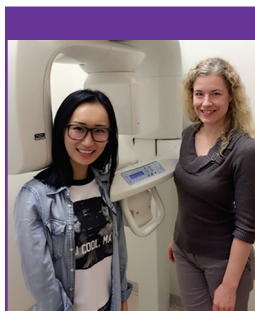
The primary benefit of the AAPM/RSNA Graduate Fellowship has been financial security. This ultimately leads to a number of academic and personal benefits. First and foremost, the fellowship

allows me to focus on academics without the stress associated with financial burdens. Furthermore, I plan on pursuing academic opportunities, such as workshops and conferences, that I might not normally consider attending due to their cost. I believe this will be crucial to my professional development. I am very grateful for the funding I am receiving from the AAPM/RSNA.

DIVERSITY RECRUITMENT THROUGH EDUCATION AND MENTORING PROGRAM "DREAM"

Celina Liyao Li

University of British Columbia,
Vancouver, Canada



"I am very grateful and honored to have been selected as a participant of the 2016 AAPM DREAM Summer Fellowship Program."

For my summer research, I have worked with Dr. Nancy Ford in the Centre for High-Throughput Phenogenomics at the University of British Columbia on a topic of medical imaging and dosimetry. During the ten weeks, we have conducted experiments at different locations including dental clinics, BC Children's Hospital, and Vancouver General Hospital, where I also had the pleasure to work with Dr. Yogesh Thakur. I deeply appreciate this precious opportunity for providing me the chance to work with medical physics experts in clinics and hospitals. This program is of significant help for me to gain practical working experience and invaluable knowledge. In our study, the standard computed tomography dose index (CTDI) method that utilizes a 100-mm pencil ionization chamber to measure the central accumulated multiple scan dose has been compared to

the dosimetry methodology proposed by the American Association of Physicists in Medicine (AAPM) Task Group 111 on adult, adolescent, and child head phantom using the Toshiba Aquilion ONE scanner for cone beam computed tomography (CBCT) acquisition. With the introduction of adolescent and child head phantom, the result has proven that the AAPM method, which uses a 2-cm thimble chamber to measure equilibrium dose (Deq), corrects CTDI dose underestimation in all different-sized phantoms. In addition, the AAPM method is accurate but time-consuming, whereas the CTDI method is a faster procedure but generates dose underestimation. For practical purposes, we would recommend to use the dose measurements by thimble chamber for scan lengths greater than 100mm with the CTDIw equation to approximate Deq.



Soleil Hernandez
MD Anderson Cancer Center,
Houston

“AAPM has allowed me to take a huge step in the right direction of my career path and I will always be thankful for that opportunity.”

The opportunity awarded to me through AAPM is almost impossible to summarize into words. I spent 10 weeks rigorously working alongside some of the nation's top physicists at MD Anderson. Each day was action packed and by the end of my fellowship, I had seen every aspect of radiation physics. My mentor, Dr. Julianne Pollard, was absolutely incredible and I can't even begin to express my gratitude for what she has done for me. She went out of her way to make sure that I came out of my fellowship with the skills, resources, and network to build my career. She spent countless hours introducing me to faculty and allowing me to see every aspect of radiation treatment offered at MD Anderson. She also reached out to me more than just in the work setting. She was always watching over my well-being and just genuinely interested in what was going on in my life. She strived to make sure that my experience at Anderson was unforgettable. Now that I have wrapped up my fellowship I am working diligently towards my undergraduate degree with more motivation and determination than ever before. My fellowship allowed me to see how my studies directly apply to real world treatment and that has given me such an appreciation for my schooling.

SUMMER UNDERGRADUATE FELLOWSHIP

Daniel Molenhuis
Stanford University, Stanford, CA

“Participation in the fellowship was very rewarding through the knowledge gained, and the friendships made along the way.”

I just wanted to take this opportunity to say that I was deeply grateful for the summer fellowship opportunity. It was an absolute honor to have had the opportunity to conduct research at Stanford University and to learn from experts in the field.

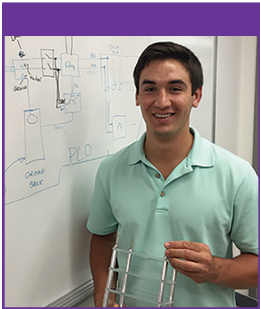
It truly was a blessing. Thank you very much for sending the survey as it gave me the opportunity to reflect on the great memories from last month.



Eric Wallat
University of Wisconsin, Madison

“Overall, the fellowship experience has helped me to gain valuable research experience in the medical physics field and further cemented my decision to apply for medical physics graduate programs.”

My experience this past summer as one of the 2016 AAPM Undergraduate Fellows was a very rewarding and educating experience. During my time spent in the Human Oncology Department at the University of Wisconsin Hospital and Clinics, I spent my 10 weeks analyzing cine-MRI motion data from the ViewRay treatment system. I worked alongside my mentor, Patrick Hill, to determine any correlations in tumor motion and trends in treatment time by site. To accomplish this, I assessed the ability of the automatic deformation and tracking algorithms of the ViewRay system and compared the motion of the target/nodule to the motion of an external surrogate. This led to recommendations for new definitions of target boundaries and gating thresholds that would decrease treatment time by 20%. By the end of the summer, I summarized my results into a paper that is in the revision process to be submitted for publication.



William Ferris

University of Pennsylvania,
Philadelphia

This summer I developed a phantom and software program to geometrically calibrate the Next Generation Tomosynthesis (NGT) system being developed under Andrew Maidment at the University

of Pennsylvania. I made a phantom with four levels of clear acrylic with six bbs set into each level. Images were taken of the phantom at each projection location and the software would input the images, process them to get rid of noise and other unwanted features, then return where the source must have been to make that specific bb pattern. In order to correctly make tomosynthesis reconstructions, the reconstruction software needed to know the exact locations of the source. This method can now be used on multiple geometric patterns in order to calibrate the NGT.



Jacob Geiger

University of Minnesota

This summer I had the pleasure of working with Dr. Watanabe at the University of Minnesota. The research project I worked on was the development of a fan-beam optical scanner using CMOS array for small field dosimetry. The

apparatus works similar to an actual CT machine but uses the attenuation of laser light rather than x-rays to create an object reconstruction. The samples scanned were PRESAGE polymer dosimeters. These samples start clear but when subjected to radiation the polymer becomes more opaque depending on dosage. When I came onto this project it was 90% of the way to full functionality, so I was tasked with the helping to get it that last little bit. By the end we were able to reconstruct an image of an irradiated sample; however, there still remains room for improvement.



Adam Harpley

St. Jude Children's Research
Hospital

“I gained valuable insight on the role of a medical physicist in the clinic, and I am excited to pursue medical physics for my graduate studies.”

This summer, I had the opportunity

to work with Dr. Marian Axente at St. Jude Children's Research Hospital in the new proton therapy center: the first of its kind developed solely for children. I gained firsthand experience in learning about both proton and photon treatment modalities and on the daily workflow for a clinical medical physicist. Additionally, I was able to witness and learn about various QA tests for the photon and proton machines, such as patient QA, beam delivery, and CT and CBCT number range comparisons. The majority of my time was spent on my project. I worked with Dr. Axente investigating the proton pencil beam scanning plan's robustness against daily body contour changes. We examined several cases of treatment plans in patients with tumors in regions of the head, thorax, and pelvis. As time progressed, variations in patient setup and anatomy occurred, so treatment plans had to be adjusted to account for the pencil beam scanning's high sensitivity to these changes. Using Eclipse, the CBCT images were registered onto the original planning CT. After defining patient anatomy changes, an algorithm was used calculate the volume dose for each daily treatment; the results were then compared using dose volume histograms. The AAPM 2016 Summer Undergraduate Fellowship provided an immensely indispensable experience in the field of medical physics.

I would like to thank AAPM for the opportunity to work in the field this summer and give sincere thanks and appreciation to Dr. Marian Axente and the staff at St. Jude Children's Research Hospital for the knowledge and memories they provided.



Irene Duba

University of California San Francisco

This summer I worked with Dr. Atchar Sudhyadhom and Zander Giuffrida, another AAPM fellow, on a project tracking the motion of the liver due to respiration via a tagging grid on MRI images. I used

the deformable image registration function on MIM to try to track movement, using scans of both a phantom and a moving liver, and determined the limits of this method. I found that, while the MIM method works well for virtually translated phantom and liver images, it does much more poorly trying to track actual motion between frames of liver scans taken while a patient is breathing.



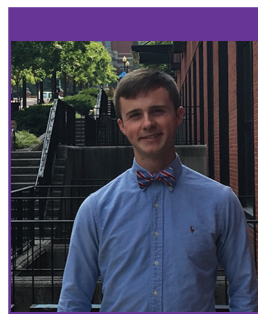
Sydney Jupitz

University of California San Francisco

The purpose of this study was to investigate Brainlab Elements as a possible alternative stereotactic radiosurgery (SRS) treatment planning modality to Gamma Knife for patients with multiple

brain metastases. The study included 15 patients previously planned and treated for multiple brain metastases SRS in Gamma Knife. Each patient had between 5 and 10 metastases, totaling 100 individual lesions. We created new treatment plans in Brainlab Elements using the prescription dose from Gamma Knife. Subsequently, both treatment plans were evaluated for plan quality in terms of brain dose, conformity, and dose-fall off. Additionally, we looked at the mean brain dose as well as the percentage of brain tissue receiving 12 Gy, 10 Gy, and 5 Gy. The Paddick conformity (CI) and gradient (GI) indices were used to find conformity and dose fall-off, respectively. Elements increased mean brain dose by 0.69 +/- 0.36 Gy on average. The V12 line was lower for Gamma Knife (mean 0.23 +/- 0.66% lower) but improved for both modalities with increasing total target volume. Gamma Knife CI (mean 0.51 +/- 0.19) degraded with decreasing lesion volume while Elements CI (mean 0.55 +/- 0.19) remained consistent. Gradient index generally favored Gamma Knife, though much improvement was observed in Elements for larger total tumor volumes and for dose fall-off farther from the lesion. Both modalities

displayed high levels of coverage of tumor volume with average coverage of 88 ± 17% for Gamma Knife and 90 ± 15% for Elements. Overall, Elements did not improve plan quality for multiple brain metastases SRS patients. However, Elements succeeded in minimizing brain dose, producing consistent conformity, and achieving steep dose fall-off outside the target. Therefore, Brainlab Elements may provide a suitable alternative to Gamma Knife for radiation oncology departments wishing to perform SRS treatments without access to Gamma Knife technology.



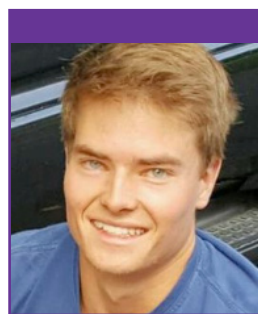
Andrew McGuffey

Johns Hopkins School of Medicine

“I have no doubt that I will utilize skills gained this past summer in applying Monte Carlo simulations to solve problems in Medical Physics in my future career, and I believe the Summer Undergraduate Fellowship to be

an excellent and invaluable opportunity for any student seeking experience in Medical Physics.”

I completed my AAPM Summer Undergraduate Fellowship at Johns Hopkins School of Medicine, and my mentor was Dr. George Sgouros. My project was primarily focused on using Monte Carlo simulations to estimate dose absorbed per decay of radioactive iodine in the salivary gland microstructure.



Robert Turner

Massachusetts General Hospital

“Thanks again for giving me this internship opportunity; it was very enlightening and provided me invaluable experience.”

This summer, I assisted in the validation process of TOPAS, which is a very powerful Monte Carlo particle transport code in the realm of medical physics developed in part at the Massachusetts General Hospital. I worked under my mentor Dr. Jan Schuemann, and I was tasked with developing a MATLAB code to organize the results of the TOPAS simulations. These TOPAS simulations were composed of different radioactive particles being fired into a virtual cylinder filled with small segments of DNA, and my code was built to determine the amounts

and types of DNA strand breaks based on the location and energy depositions of the interacting radiation. These results were then compared to experimental results in order to determine the accuracy of TOPAS when the target being investigated is DNA.



Daniel Shinnick

VA Boston Healthcare System

I worked primarily with the validation of the imaging component of a pipeline using publicly available phantom data. This portion of the pipeline reads off different quantitative values (i.e. volume, surface area) from lung

tumors in CT scans to assist the tumor board in assessing tumor progression and making treatment plan decisions. The validation was performed over a variety of CT settings and tumor shapes and sizes, and the results were presented to the lab group at the completion of the fellowship.



Brad Stiehl

University of California, Los Angeles

“These 10 weeks proved to be an incredibly rewarding experience and I am very thankful to AAPM and my mentors for making it all possible.”

This Summer, I had the privilege of working with Dr. Minsong Cao

and Dr. Dan Ruan. The focus of my research dealt with recent technological advances in treatment planning software. The purpose of my study was to investigate whether atlas based automatic segmentation performed on a commercial platform may be capable of producing

clinically acceptable contours that perform comparably to contours produced by an expert when used for dose volume histogram (DVH) generation and tested against dosimetric plan quality measurements. Existing studies have been restricted to correlating the geometry between the contours generated by auto-segmentation (AS) and manual segmentation (MS). Such findings, while valuable, do not directly reflect the effect of utilizing AS contours in the evaluation of dosimetric plan quality measurements. The beginning of my project involved becoming familiar with the commercial software, MIM, and the current academic literature surrounding the topic. We decided to test 15 anonymized patients for each region of interest, prostate and head neck, and an atlas was built for each. The next step of my project included the generation of AS contours with the atlas-based automatic segmentation feature and the collection of geometric, volumetric, and DICOM image data for both the AS and MS contours. I was then able to construct programs using MATLAB to run through this data and test the geometrical correlation of the two sets of contours using specific metrics. Furthermore, I was able to apply the dose file associated with the MS to the AS contours and compare their performances when tested against dosimetric plan quality measurements. Lastly, we ran through this same contour generation and comparison process for the head and neck region using both CT and MRI image sets in hopes of determining which provided AS contours that performed better in terms of geometric correlation and dosimetric plan quality measurements. The time I spent at UCLA this summer provided an excellent opportunity to observe top academic professionals in the field of medical physics. Not only was I able to participate in a great learning experience but I also built connections with other members of the medical physics community.



The AAPM Development Committee hopes that these testimonials to the value of your contributions will encourage greater support for the AAPM Education & Research Fund and the worthwhile activities the Fund supports. As Chairman of the Committee I urge each and every

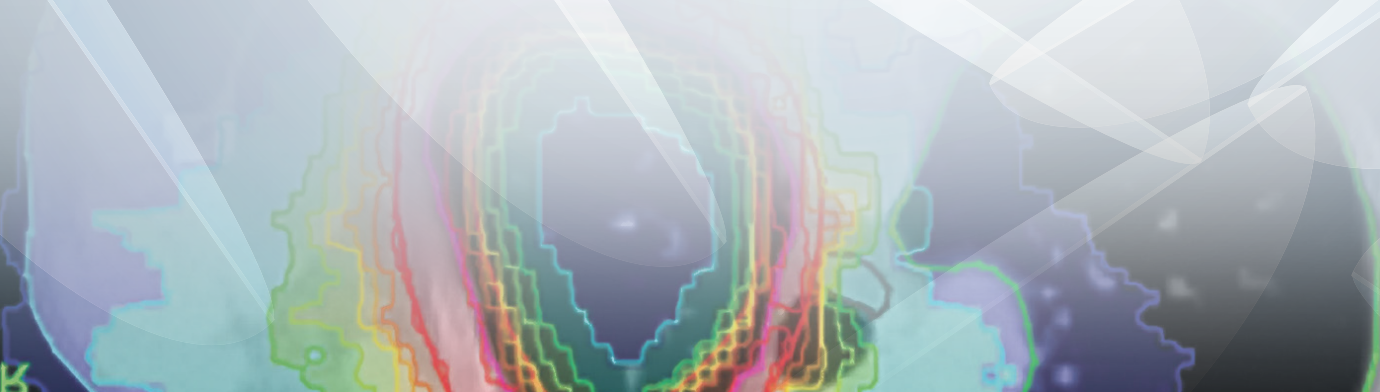
AAPM member to contribute a minimum of \$100 annually to support our educational and research activities. We must strive to obtain the level of contributions that will help to

accomplish our mission of much-needed educational and research opportunities for our young professionals.

We truly appreciate and thank you for this support. On the following pages is a listing of the many who have given their support to the Fund.

Colin G. Orton, PhD
Chairman, AAPM Development Committee





CONTRIBUTORS

to the Education & Research Fund (as of June 12, 2017)

AAPM would like to thank the following individuals who have made contributions to the Education and Research fund since its inception in 1990:

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