AAPM EDUCATION & RESEARCH FUND

AMERICAN ASSOCIATION *of* PHYSICISTS IN MEDICINE

2021 Annual Report

focus on **our future**

AAPM Education & Research Fund

Annual Report 2021

The AAPM Education & Research (E&R) Fund, established in 1990, supports the development of our vital medical physics profession by funding strategic education and research programs and awards. Research support includes seed grants for early-career researchers, a mentorship program, and travel grants. It also recognizes exceptional research through funding best paper awards for our AAPM journals.

Education support includes matching grants for clinical residency programs, fellowships for graduate students, and travel and tuition awards. It also funds an innovation in education award and distinguished lectureships. Of great significance the Fund is used to attract undergraduates to medical physics and to promote diversity by supporting the Summer Undergraduate Fellowship Program (SUFP) and the Diversity Recruitment through Education and Mentoring (DREAM) Program.

The Education & Research Fund receives revenues primarily from member donations, donations from our local chapters and related organizations, and the transfer of funds from the AAPM operations budget. As always, AAPM is extremely grateful for these generous gifts. Member donations, which are an essential component and provide the catalyst for other revenue sources, contribute to multiple purposed funds in the E&R Fund's portfolio of funds, many being named or memorial funds. In 2021, the AAPM E&R Fund supported approximately $435,000 in programs and awards.

This report recognizes recipients of the following grants, fellowships, and awards funded by the E&R Fund in 2021:

- **Research Seed Grants**

  Science Council, through its Research Committee, funded three $25,000 research seed grants for new researchers in medical physics.

- **ASTRO-AAPM Physics Resident/ Post-Doctoral Fellow Seed Grant**

  In 2021, American Society of Radiation Oncology (ASTRO) and AAPM continued to jointly award a $25,000 grant to a radiation oncology physics resident to support an early career scientist involved in advancing radiation oncology through physics-related research.

- **Imaging Physics Residency Program Grants**

  In 2017, the AAPM Board of Directors approved $140,000 in funding for two new imaging physics residency positions, either in diagnostic, diagnostic with a nuclear medicine option, or nuclear medicine. Two institutions with such programs, selected in 2018 for funding in July 2019 and 2020, received $35,000 each year as matching support for one resident.

  In 2019, to extend that program, AAPM Board of Directors approved $420,000 and the Radiological Society of North America provided $210,000 to support together nine two-year residencies in imaging physics. Awarded in 2019, 2020, and 2021, each of two programs are receiving $35,000 per year in matching funds for one resident commencing in the following two years.

- **Graduate Fellowships in Medical Physics**

  Education Council awarded $36,000 to support the first of two years for the fellow selected for the 2021-2023 AAPM/RSNA Graduate Fellowship in medical physics and the second of two years for the fellow selected for the 2020–2022 AAPM Graduate Fellowship in medical physics.

- **Summer Undergraduate and DREAM Fellowships**

  Education Council, through its Education & Training of Medical Physicists Committee (ETC), used $82,500 to fund 15 undergraduate fellowships in the Summer Undergraduate Fellowship Program (SUFP) and another $60,500 to fund 11 undergraduate fellowships in the Diversity Recruitment Through Education and Mentoring (DREAM) Program.

- **Journal Publication Awards**

  Endowed funds supported the 2021 annual *Medical Physics* awards for best papers in 2020 in the areas of radiation therapy and imaging, the Farrington Daniels Award and the Moses and Sylvia Greenfield Award, respectively. Endowed funds also supported the 2021 annual *Journal of Applied Clinical Medical Physics* awards for outstanding articles in 2020 in four areas of medical physics in honor of its first four editors, Michael D. Mills, Peter R. Almond, George Starkschall, and Edwin C. McCullough.

- **Distinguished Lectureships**

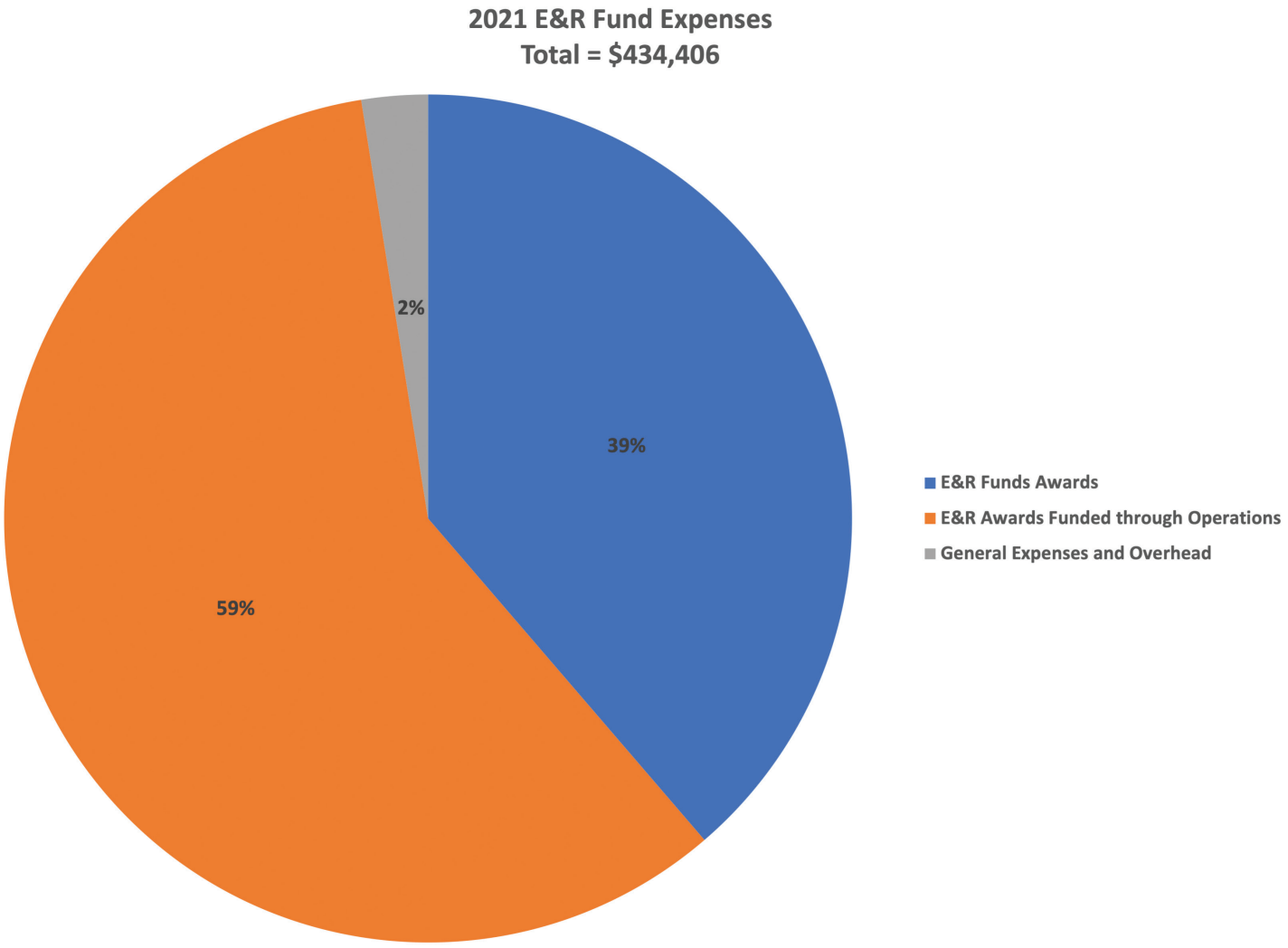
  Our Virtual AAPM Annual Meeting benefitted from two distinguished lectureships supported annually by endowed funds. These are the Carson/Zagzebski Distinguished Lecture on Medical Ultrasound and the Anne and Donald Herbert

Distinguished Lectureship in Modern Statistical Modeling.

- **Annual Meeting Awards**
  Research awards made at our 2021 AAPM Annual Meeting include the Jack Fowler Junior Investigator Award, the Jack Krohmer Junior Investigator Award, and the John R. Cameron-John R. Cunningham Young Investigators Symposium awards. Also, the Award for Innovation in Medical Physics Education was made.

- **Other Awards**
  Other awards aimed at cultivating junior medical physics researchers and at providing medical physics education include (1) AAPM Expanding Horizons Travel Grants, (2) AAPM Science Council Associates Mentorship Program, (3) AAPM Summer School Tuition Scholarships, and (4) the TeamBest/AAPM Travel Awards.

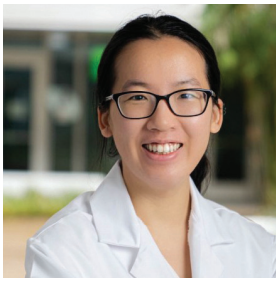
The benevolence of our members, chapters, and related societies is greatly appreciated, without which these programs and awards would not be possible. The pages to follow detail 2021 award recipients and testimonials, which demonstrate the enormous value the recipients place on this support. As you read the reports, consider how these programs impact our medical physics profession by attracting bright, young people into our profession, encouraging development of quality graduate and resident medical physics education programs, helping develop outstanding research scientists, and recognizing outstanding research and education accomplishments of many, ***all starting with your contributions to our AAPM E&R Fund.***



Oleksandra Ivashchenko, PhD, Postdoctoral Fellow
Leiden University Medical Center | Department of Radiology

Anatomy-driven tomographic reconstruction of freehand untracked liver ultrasound

Conventional two-dimensional (2D) ultrasound (US) imaging has been widely used for many clinical applications, such as medical diagnosis, imaged-guided surgery, and is plausibly the most widely used type of diagnostic imaging worldwide. At the same time, it fails to offer physicians a volumetric visualization of the organ, which challenges 3D localization and perception of the target anatomy. There are two readily available ways to circumvent such a limitation of 2D US: using 4D phase array or optical/electromagnetic tracked transducers. However, none of these methods easily translate to a minimally invasive surgical environment, hampering the realized clinical benefit of the modality at the moment. Our project will investigate a novel strategy for a tomographic reconstruction of fully freehand and tracking-free liver US. We propose to tackle the challenge by incorporating a transfer knowledge about the underlying geometry of the US image and liver vasculature anatomy into the training of a CNNbased reconstructor (e.g., 3D GAN). We expect that if attention of the model will be steered toward volumetric analyses of the underlying vasculature, it would be possible to perform a true 6 degrees of freedom alignment of separate 2D US images, subsequently converting them into a tomographic dataset. The AAPM Research Grant enables Oleksandra to evaluate the feasibility of the method and will play a major role in her transition to independent researcher.



Qihui Lyu, PhD, Medical Physics Resident
University of California, Los Angeles | Department of Radiation Oncology

Adding new degrees of freedom to radiotherapy treatment using reinforcement learning and deep neural networks

Radiotherapy has been one of the most powerful and effective methods to treat cancer. However, delivering a curative dose to the tumor is often hindered by the normal tissue toxicity of therapeutic beams with the current treatment planning algorithm. Existing planning methods using inverse optimization techniques are limited to very restricted searching space due to ineffective and inefficient computation algorithms and limited computation resources. We hypothesize that combining all degrees of freedom in the searching space would further improve treatment quality and fully exploit the beam-shaping capabilities of existing treatment machines. We further hypothesize that deep reinforcement learning algorithms can significantly reduce dimensionality and computation complexity while identifying dosimetrically promising beam configurations in the full searching space. We are currently developing a rapid treatment planning algorithm with deep reinforcement learning, and comparing it with inverse optimization. The AAPM seed grant award supports the algorithm development and the proof-of-principle study, and it provides valuable experience for me to transition to an independent researcher.

The Research Seed Funding Grant

Three $25,000 grants were awarded to provide funds to develop exciting investigator-initiated concepts, which will hopefully lead to successful longer term project funding from the NIH or equivalent funding sources. Funding for the 12-month grant period began July 2021. Research results are submitted for presentation at future AAPM meetings.

Sponsored by the AAPM Science Council through the AAPM Education & Research Fund. (See AAPM website for more details, including eligibility requirements.)

Yang Sheng, PhD, Assistant Professor
Duke University Medical Center | Department of Radiation Oncology

Understanding human-robot interaction of artificial Intelligence (AI) tool in radiation oncology: an application of breast cancer treatment planning agent

This project aims to understand human-robot interaction and improve integration of artificial intelligent (AI) treatment planning agent in the radiation oncology department. Our institution developed an AI agent for whole breast radiation therapy treatment planning and has been deployed clinically since 2019. With over 1,000 cases accumulated so far, we will investigate how human operator views the AI tool in clinical setting so we can close the feedback loop to improve the agent. The project focuses on two aspects: (1) dissect the trajectory of clinical integration of the breast auto planning AI agent for human planner; (2) understand the state of the human planner at certain stage of treatment planning and instill human's decision making in the AI agent. In the first aspect, the interaction the human operator inputs will be analyzed to reflect the strength and weakness of the AI agent and will be used to self-alert the quality of the overall performance. In the second aspect, we will generate a decision making policy using Markov Decision Process to analyze a plan's status as a human planner would do and taking proper actions. This grant helps purchase equipment for this project and prepare preliminary result to submit NIH grant.

ASTRO-AAPM Physics Resident/Post-Doctoral Fellow Seed Grant

One $25,000 grant was jointly awarded by AAPM and the American Society of Radiation Oncology (ASTRO) with the goal of advancing the field of radiation oncology in novel ways through the support of early-career scientists involved in radiation oncology physics-related research.

Sponsored by the AAPM Science Council through the AAPM Education & Research Fund and the American Society of Radiation Oncology (ASTRO). (See AAPM website for more details, including eligibility requirements.)

Devin Miles, PhD, Medical Physics Resident
Johns Hopkins University School of Medicine | Department of Radiation Oncology

Proton FLASH radiation therapy of uveal melanoma: design, implementation, and in-vivo validation

Ultra-high dose rate radiation (>40 Gy/s; FLASH-RT) has immense transformative potential to widen the therapeutic ratio and reshape radiation oncology practice. Tumors of the eye, such as uveal melanoma(UM), are attractive first steps in the translation of FLASH irradiation for human applications because the lesions are usually small, close to sensitive structures of the eye, and are difficult to treat without movement. To determine if FLASH effects can be produced in the eye, we will develop a system for irradiating the eye of a mouse using a narrow beam from a proton synchrotron at normal and FLASH dose rates. Computer models of the beam will be designed so that we can accurately predict the dose and dose rate during treatment. UM tumors in mice will be treated with the appropriate proton pencil beam, and changes in the tumor and normal tissues will be observed over time. The proposed platform will provide a foundation for further research in ocular FLASH effects in larger mammals, with the key goal of translation to human patients.

AAPM/RSNA Imaging Physics Residency Grants

The AAPM Board of Directors approved $420,000 in support over six years ($70,000/year starting in 2020) to fund six positions in existing or new imaging physics residency programs, and in support, the Radiological Society of North America (RSNA) Board of Directors approved $210,000 for an additional three positions. The intent of these funds is that after the period of the award is over, the awardee institution(s) will continue to fully support these imaging physics residency positions. With this funding, the awardee's institution(s) will receive $35,000 per year for two years as matching support (50/50) for one imaging physics resident. This provides matching funds for nine imaging physics residents over the next six years. (See AAPM web site for more details.)

Two institutions received $35,000 each per year for two years as matching support for one resident. Programs are selected for the award to be funded over the following two years.

Awarded 2021
1st Year Funding 2022
2nd Year Funding 2023

Scott Cupp, MS, Director
Department of Radiology, University of Pennsylvania/ Penn Medicine | Imaging Physics Residency Program

Mi-Ae Park, PhD, Director
Department of Radiology, University of Texas Southwestern | Medical Imaging Physics Residency Program

Awarded 2020
1st Year Funding 2021
2nd Year Funding 2022

Lindsay S. DeWeese, PhD, Director
Department of Diagnostic Radiology, Oregon Health & Science University | Diagnostic Imaging Physics Residency Program

David W. Jordan, PhD, Director
Department of Radiology, University Hospitals Cleveland Medical Center | Medical Imaging Physics Residency Program

Awarded 2019
1st Year Funding 2020
2nd Year Funding 2021

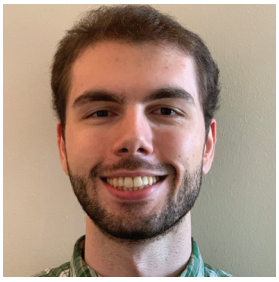
David Hintenlang, PhD, Director
Department of Radiology, Ohio State University | Imaging Medical Physics Residency Program

Yogesh Thakur, PhD, Director
Vancouver Coastal Health Authority | Medical Physics Residency Program in Medical Imaging and Nuclear Medicine

Graduate Student Fellowships

The AAPM Graduate Fellowship and AAPM/RSNA Graduate Fellowship are awarded in alternating years. Each Fellowship is awarded for the first two years of graduate study leading to a doctoral degree in Medical Physics (PhD or DMP). Both BSc and MS degree holders are eligible to apply. A stipend of $13,000 per year, plus tuition support not exceeding $5,000 per year, is assigned to the recipient.

Sponsored by the AAPM Education & Research General Fund. (See AAPM website for more details, including eligibility requirements.)



AAPM/RSNA Graduate Fellowship (2021–2023)

Skylar Gay

The University of Texas MD Anderson Cancer Center
UTHealth Graduate School of Biomedical Sciences

I'm all-too-familiar with the toll that cancer exacts on patients and their loved ones, having lost my dad after a nine-year battle against metastatic melanoma. Through my studies and professional career, I want to ease the burden of cancer for others across the world just as others in this field did for me and my family. To accomplish this, I'm spending my first year continuing to learn how to leverage artificial intelligence and our ever-connected world to bring fully-automated, high-quality radiotherapy planning to low- and middle-income countries. These regions, which carry the majority of worldwide cancer deaths, are often severely understaffed and unable to offer these life-changing treatments to all the patients who desperately need it. By developing fully-automated planning techniques, we hope to bridge this gap so that no one, no matter their geographic location, is unable to receive radiotherapy due to staffing deficiencies. Thus, I'm grateful for the AAPM Graduate Fellowship, which will help me advance in my goals and blend my love of physics with the desire to serve others through the rest of my career.

AAPM Graduate Fellowship (2020–2022)

Daniela Olivera Velarde

University of Chicago

As a medical physicist, my goal is to create a better world through science by improving the treatment of cancer patients. I chose the field of medical physics because not only would it allow me to use experimental and theoretical approaches in finding better ways to treat or diagnose cancer, but it will also allow me to implement them as part of a healthcare team. During my first year in the Graduate Program in Medical Physics at The University of Chicago, I learned the mathematics and the physics behind cancer treatment with radiation and the different diagnostic modalities. I also took practicum courses in radiation therapy and imaging in which I learned QA and QC procedures typically performed in the clinic. My research project is on the development of an implantable device to measure oxygen levels in cancer tissues, which would allow the personalization of treatment plans. My other research interests are compensator-based small animal IMRT and developing a task-based image quality assessment in fluoroscopy. Receiving the AAPM Graduate Fellowship is allowing me to work on different research projects to acquire a vast amount of knowledge and a wide range of skills without having to worry about the financial aspect.

Summer Undergraduate Fellowship Program (SUFP)

Edward Criscuolo
University of Connecticut | Senior, Molecular and Cell Biology, Applied Physics

Mentor: Edward Graves, PhD
Stanford University, Department of Radiation Oncology-Radiation Physics

Application of a convolutional neural network to the segmentation of lungs in mice

My project explored the exciting field of machine learning. Starting with the established segmentation network U-NET, I developed a training set of segmented lungs in CT scans of mice. I then defined the U-NET model using the python library Keras, and processed and provided the data to the model for training and validation. The project is still ongoing, but preliminary results show a promising capability of the network to segment lungs at a high accuracy. Down the road, I hope to expand the scope by utilizing machine learning to develop a treatment plan for lung tumors. Machine learning can potentially help save medical professionals critical time and money in diagnosing and treating patients. It can also extend into preclinical-research by helping to standardize methods for treating animal models. My project will help push the boundaries of this research, further demonstrating the capabilities of machine learning and convolutional neural networks in medicine. My project wouldn't have been possible without the AAPM and the gracious help of researchers at Stanford. Both my advisor, Professor Edward Graves, and post-doctoral scholar Rasoul Sali helped me learn about medical physics and AI, as well as guide me through the research process. This fellowship has been a life-changing experience, and has given me the confidence to pursue a graduate education in medical physics. I am very grateful for this opportunity, and I hope to continue to work to advance this amazing field.

Jade Fischer
University of Calgary | Senior, Physics

Mentor: Atchar Sudhyadhom, PhD
Brigham & Women's Hospital/Dana Farber Cancer Institute/Harvard Medical School, Department of Radiation Oncology

Improving electron density calculations using cycle-consistent generative machine learning

I spent my summer fellowship working with Dr. Sudhyadhom at Brigham & Women's Hospital. This project centered around a previously developed methodology to directly determine highly accurate electron density based on computed tomography (CT) Hounsfield Units (HU) and knowledge of molecular compositions identified through an MRI scan. The accuracy in this technique is limited by the image registration between the required CT and MRI scans. To overcome this limitation, we sought to utilize a variation on cycle-consistent generative adversarial network (CycleGAN) machine learning to learn the transformation from MRI intensity values or CT Hounsfield Units (HU) directly to

The Summer Undergraduate Fellowship Program is a 10-week (40 hours per week) summer program designed to provide opportunities for undergraduate university students to gain experience in medical physics by performing research in a medical physics laboratory or assisting with clinical service at a clinical facility. The mentor and fellow determine the exact 10-week schedule (May-September). In this program, AAPM matches exceptional students with exceptional medical physicists, many who are faculty at leading research centers. Students participating in the program are placed into summer positions that are consistent with their interest. Selected for the program on a competitive basis, summer fellows receive a $5,500 stipend from AAPM.

NOTE: All Fellowships were conducted virtually due to COVID-19.

Sponsored by the AAPM Education Council through the AAPM Education & Research Fund with additional fellowship provided by the AAPM Northwest Chapter. (See AAPM website for more details, including eligibility requirements.)

electron density. My contribution to this project was image preprocessing required for successful machine learning. This process required image clean-up, debiasing, normalization across patients, and electron density calculations utilized in the learning process. This fellowship cemented my interest in the field of medical physics and exposed me to novel technologies that I had yet to understand. I enjoyed the opportunity to participate in clinical shadowing, which helped me better understand the daily roles and responsibilities of a medical physicist. I enjoyed learning from and collaborating with many dedicated researchers from diverse backgrounds. Additionally, I appreciate my supervisor's continuous support and investment in my professional development as a scientist.

Joshua Genender
Northwestern University | Senior, Physics

Mentor: Maryellen L. Giger, PhD
University of Chicago, Department of Radiology

Attention u-net for ultrasound thyroid nodule segmentation

I had the privilege of working with Dr. Maryellen Giger at the University of Chicago this past summer. In diagnostic radiology, the process of manually classifying and delineating nodules in the thyroid gland is subject to intra- and interobserver variability. Thus, procedures like fine-needle aspiration cytology (FNAC) and nodule excision are common. Hoping to reduce the need for surgical intervention, our project focused on applying machine learning models in the quantitative assessment of thyroid nodules. My contribution to this project was using convolutional neural networks (CNNs) to segment thyroid nodules in ultrasound images. We used Python to build a U-Net with attention gates, a CNN architecture that suppresses irrelevant regions of an image, and trained our model using patient ultrasound data. After optimizing our hyperparameters, we found that our attention-U-Net-based model produced highly accurate segmentation predictions of thyroid nodules, particularly for input images cropped to a region of interest. Our model was also capable of basic multi-lesion detection tasks, which could assist a physician in identifying small-diameter nodules (<1 cm). During this fellowship, I learned about machine learning in medical image analysis and CAD/CADx design. Additionally, this experience has reaffirmed my desire to pursue a career in medical physics, and I am grateful to AAPM for the opportunity to work under the mentorship of Dr. Giger and her team.

Marissa Iraca
University of Mount Union | Senior, Applied Physics

Mentor: Assen Kirov, PhD
Memorial Sloan Kettering Cancer Center, Department of Medical Physics

Y90 microsphere counting and dosimetry

This past summer I had the remarkable opportunity to virtually work under Dr. Assen Kirov through Memorial Sloan Kettering Cancer Center. I gained experience with the software TMARKER, ImageJ, and myVGL to train a program that can automatically compute the number of Y90 microspheres in a treated tumor. After evaluating multiple parameter combinations from each software, it was decided that manually counting the microspheres is the most reliable method. Then the software MIM was used with its Y90 SurePlan to analyze treated patient data. This study compared the prescribed dose and activity for the given tumor volume with the received treated dose and activity. The discovery from this study is that the received treatment was more or less than the prescribed treatment depending on whether glass or resin microspheres were used. This fellowship opened my eyes to the immense impact physics has towards cancer treatment and has helped me to solidify my plan to pursue a career in medical physics. I am truly grateful for the hands-on experience this fellowship granted me.

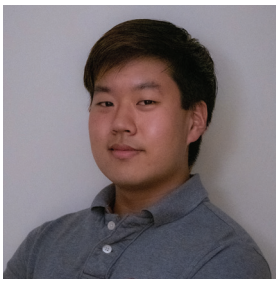
Alaina Kelley
University of Mount Union | Senior, Physics, Applied Mathematics

Mentor: Luis Perles, PhD
The University of Texas MD Anderson Cancer Center, Department of Radiation Physics

Using full dose volume histogram curves as planning criteria

This summer I worked with Dr. Luis Perles at The University of Texas MD Anderson Cancer Center on a research project with the goal of using dose volume histograms as treatment planning criteria. This involved writing scripts in Python to export the dose volume histogram data for a large number of patients and then organizing and analyzing it. As a direct result of this research experience, I was able to gain familiarity with RayStation, a popular treatment planning system, as well as further develop my data analysis and problem-solving skills. Additionally, I learned more about the field of medical physics and received insight about the

day-to-day activities of medical physicists. Overall, the AAPM Summer Undergraduate Fellowship Program was a great experience, and I am very grateful I had the opportunity to participate in this awesome program.



Caleb Kwon
Villanova University | Senior, Physics

Mentor: Yiwen Xu, PhD
Princess Margaret Cancer Centre, University of Toronto, Radiation Medicine Program

Clinical decision support tool for lung metastases

This summer, I had the opportunity to work for the University Health Network (UHN) with Dr. Yiwen Xu. With a small team, we worked on developing a clinical decision support system for lung metastases. This would be a machine learning model that would learn to make decisions based on certain parameters derived from contours of a patient and patient data. My main responsibility for this project was to develop scripts that would extract parameters from contours that would be utilized in training our model, as well as contouring CT scans that would be used for developing the model. The implementation of this system would assist the decision making process of patients by working alongside a lung tumor board and make for a better overall decision making process. In addition to this, I was able to observe a few clinical responsibilities of a medical physicist such as contouring patients, quality assurance of machinery, and learn overall the role of a medical physicist in a workplace. Overall, this was an amazing opportunity for me as I gained experience and knowledge that will follow me in the future as I pursue graduate work in medical physics. I am extremely grateful for the opportunity given to me through the AAPM Fellowship Program that allowed me to work and have such an enriching experience.

Jason Lima
Hofstra University | Senior, Physics

Mentor: Piotr Zygmanski, PhD
Harvard Medical School , Dana Farber Cancer Institute, Brigham and Women's Hospital, Department of Radiation Oncology

Development of resistive electrode detector arrays for radiotherapy beam monitoring

In the present day of radiation oncology, there are procedures in place such as patient specific IMRT QA to ensure that everything is accurate on the side of the linear accelerator. However, this can only be done before the patient arrives to be treated, and there is currently no way to monitor the beam as it is being delivered. This project aims to add another layer of security for the patient by the addition of a new Resistive Electrode Array (REA) which will be able to monitor an ionizing beam of radiation in real time. My role in this project was to help further develop this idea into a reality by fabricating various prototypes, testing and collecting data from a linear accelerator with the prototypes, and help analyze the data to determine how to move forward with development. In a nutshell, the latest prototype of the REA is composed of one central highly resistive electrode that is grounded, and two outer electrodes that are held at a constant voltage. The resulting electric field will inject ions created by the beam into the central electrode which generates a signal between probes placed along its perimeter. In this 10-week period, we were able to create and test three different prototypes to further our understanding of the physical theory behind this idea. The experience gained and connections made from this fellowship are invaluable to me, and I've gained a level of overall hands-on understanding with medical physics that I could not have found anywhere else.

Corbin Maciel
Brigham Young University | Senior, Physics

Mentor: Harald Paganetti, PhD
Massachusetts General Hospital, Department of Radiation Oncology, Physics Division

A study on the effects of metal implants in proton therapy

We wanted to understand more about how metal implants can affect proton therapy. Two treatment simulations were run on a patient. One where there was not metal included within the patient CT, and one where there was a metal geometry overlaid within the patient. From these two simulations we were able to compare the results and see some of the effects that can happen when they scatter because of interaction with the metal. The project is important because it is seeking to understand these effects so that steps can be taken toward making the treatment planning process less difficult for situations like this. The reason treatment planning is so difficult is because of the scattering created by the metal. This makes the treatment planning process less predictable, thus making it difficult to prescribe a plan. These simulations were performed using TOPAS and the results were analyzed using CERR. More specifically, I used TOPAS on my own computer to create the metal geometry

in the patient. I then used MGH's cluster to simulate the patient data. After the simulations were complete, the output dose files and the plan files were taken and used to create a file that could be read by MATLAB for CERR. I was able to complete the simulation and analysis of the first patient, thereby obtaining the preliminary results for the study. I have learned that I would like to perform research in proton/heavy ion therapy, Monte Carlo Simulation, or artificial intelligence applied to medical physics.

Henry Meyer
Carthage College | Junior, Physics

Mentor: Radhe Mohan, PhD
The University of Texas MD Anderson Cancer Center, Department of Radiation Physics

A Monte Carlo study of the mechanism of proton-boron fusion therapy

This summer, I had the privilege of working on a project in which I investigated the mechanism of Proton-Boron Fusion Therapy. My work primarily involved the creation of a Geant4-based monte carlo simulation for a proton beam incident on a Boron target. This work aimed to provide resolution to some academic dissonance surrounding the mechanism behind enhanced biological effectiveness seen in some studies of Proton-Boron Fusion Therapy. This work has resulted in the production of a manuscript that has been submitted to the *Medical Physics Journal* as a technical note, with myself as the primary author, which is currently under review. My participation in AAPM's Summer Undergraduate Fellowship Program has given me incredible opportunities to work with incredibly talented and supportive faculty at the MD Anderson Cancer Center. Although I was not able to be at MD Anderson in person this summer, I was still able to have an excellent experience getting to collaborate with their world class faculty. My mentor, Dr. Radhe Mohan, facilitated an excellent summer experience, in spite of the distance, and was able to provide me with invaluable insights into the field of medical physics and how it has developed over the past 50 years.

Joseph G. Piccolo
Emory University | Senior, Physics

Mentor: George Sgouros, PhD
Johns Hopkins University, School of Medicine, Department of Radiology and Radiological Science

Predicting differences in tumor to non-tumor fosage ratio in theranostic pairs

In advanced cases of cancer, metastatic lesions proliferate in different parts of the body. This systemic disease requires a systemic treatment, which can be found in the rapidly developing field of radiopharmaceutical therapy. This is the 'nuclear option' in cancer treatment, which focuses on the targeted delivery of potent radiation (and therefore energy) to tumorous tissue via radionuclides. A theranostic pair is made up of two radiopharmaceuticals with comparable biological activity but different characteristic radiations. The dosimetric study agent's primary goal is to be actively imaged, using a diagnostic tool like PET or CT, to determine proper targeting and dosage to tumor tissues by the delivery mechanism. The therapeutic agent, possessing similar biological activity, aims to target the same tissues as the DSA but in this case, destroy the cancer with radiation. With the guidance of my faculty mentor, I developed a 2-compartment model to describe the difference in tumor/non-tumor dosage ratio between the radiopharmaceuticals of a theranostic pair. I loved the opportunity to apply my quantitative background to the field of medicine. From my research fellowship I have learned that the future of healthcare lies in precision medicine, which is treatment geared towards the individual patient. This type of healthcare will require quantitatively strong providers, and medical physicists will be at the forefront to face those challenges!

Chase Ruff
University of South Florida | Senior, Physics

Mentor: Gabriel O. Sawakuchi, PhD
The University of Texas MD Anderson Cancer Center, Department of Radiation Physics

An empirical model of proton RBE based on the linear correlation between x-ray and proton

The project was concerned with testing a novel relative biological effectiveness (RBE) model for protons, which

provides a more accurate estimate of proton RBE compared to the constant value of 1.1 (which is generally assumed). An accurate description of RBE is necessary because RBE values are required for treatment planning. If an inaccurate value of RBE were to be used, then inaccurate radiation doses may be present in the final treatment plan. To test the validity of the proposed model, we fit three additional established RBE models (along with our own) to a large database of experimental data and performed statistical analyses on each model. Using three different goodness-of-fit metrics, the proposed model performed best. Additionally, we imported this model into the Eclipse treatment planning software to show its validity for clinical use. This fellowship has given me additional insight into my future career plans and research goals and has shown me that computational research can have value in both research and the clinic. During graduate school, I would like to continue to improve my computational skills and conduct computational research that has clinical significance.

Caitlin Welch
Davidson College | Senior, Physics, Math

Mentor: Carri Glide-Hurst, PhD
University of Wisconsin, School of Medicine and Public Health, Department of Human Oncology

Cardiac dosimetric endpoints and multi-criteria optimization

For my summer research project, I focused on cardiac dosimetric endpoints and Multi-Criteria Optimization (MCO). Radiation therapy is widely used and has a high cure rate, so it is important to minimize the long-term risk of the treatment by sparing vital organs, such as the heart. Traditionally, medical physicists spare the heart by focusing on the mean heart dose, or the maximum dose that the heart can, on average, withstand. Such a treatment method can cause the heart to receive a dangerous dose in certain substructures, while others may be able to receive a higher dose. So, this project aimed to look at a way, using RayStation's MCO module, to plan a treatment that includes cardiac sparing of substructures. MCO looks at the trade-offs between maximizing the amount of the target that receives less than the prescribed dose, while minimizing the amount of the organs at risk that receives more than the tolerance dose. To apply cardiac sparing of substructures, we had to add each substructure as a separate organ at risk with unique tolerant doses. The project was accomplished through a series of literature reviews and tutorials with RayStation. It was important to learn about the current research in the field, both relating to cardiac sparing and MCO, before we embarked on our own studies. Much of the execution of the project was related to treatment planning, so we spent some time becoming familiar with RayStation, including meetings with a RayStation employee.

Andrew White
Wofford College | Senior, Physics

Mentor: Mark Oldham, PhD
Duke University, Department of Radiation Oncology

Investigation of a novel 3D dosimetry system based on ClearView radiochromic dosimeters

Certain radiation-based cancer treatments rely on precise and accurate targeting of complex tumor cells embedded in healthy tissue. We aimed to explore and evaluate the accuracy of these specialized radiation deliveries using a novel 3D dosimetry system consisting of ClearView dosimeters and the Duke Large Field of View Optical CT Scanner (DLOS). In our experimentation, two (simulated) tumors were targeted using a 6 MV photon beam and were subsequently scanned using a telecentric optical CT scanner. The resulting CT images were registered with the clinical treatment planning system to compute relative dose comparisons. The data was analyzed using 3D Slicer, MATLAB and in house software. The two-target irradiations yielded gamma pass rates well above the widely accepted threshold for stereotacticradiosurgery (SRS). The efforts of this research reveal an opportunity to replace existing imperfect 2D systems with a more accurate, comprehensive 3D approach. I cannot speak highly enough of this fellowship program. The insight and knowledge that I acquired over the summer confirmed my desire to enter the field of radiation therapy, while also providing a background for future research projects. The faculty and graduate students at Duke were amazing hosts and continue to serve as mentors for me. I was humbled to be a part of such an incredible opportunity.

Karen Rex
University of Florida | Junior, Physics, Math

Mentor: John G. Eley, PhD, Vanderbilt University School of Medicine, Department of Radiation Oncology

Ethan Douglas Stolen
Augusta University | Senior, Physics

Mentor: Kenneth B. Bader, University of Chicago, Department of Radiology

Diversity Recruitment through Education and Mentoring Program (DREAM)

Diversity Recruitment through Education and Mentoring Program (DREAM) is a ten-week (40-hours per week) summer program designed to increase the number of underrepresented groups in medical physics by creating new opportunities, outreach, and mentoring geared towards diversity recruitment of undergraduate students in the field of medical physics. Students participating in the program are placed into summer positions that are consistent with their interest. Selected for the program on a competitive basis, DREAM fellows receive a $5,500 stipend from AAPM.

NOTE: All Fellowships were conducted virtually due to COVID-19.

Sponsored by the AAPM Education Council through the AAPM Education & Research Fund, which also includes funding for four additional grants provided by the American Institute of Physics (AIP) Diversity Action Fund and one fellowship funded by the AAPM Northwest Chapter. (See AAPM website for more details, including eligibility requirements.)

Corrie Burroughs
Purdue University | Senior, Radiological Health Sciences: Pre-Medical Physics

Mentor: George Sgouros, PhD
Johns Hopkins University, School of Medicine, Department of Radiology and Radiological Science

Introduction to radiopharmaceutical therapy

Throughout my fellowship, I was introduced to the field of radiopharmaceutical therapy (RPT) through a few different projects. I first learned about RPT by going through the different literature for my projects. Then I was placed on a team of summer students where we contoured the liver, spleen, bone marrow, heart, lungs, and kidneys on CT images of two canines that had undergone RPT to help treat their osteosarcoma. From this contouring, we were able to draw data that will help analyze the individual organ absorbed dose from this therapy. Outside of contouring, I was on a project which worked to develop a pharmacokinetic compartmental model using SAAM II. This model was built to theoretically test whether, in the future, it would be possible to use Pb-212 instead of Ac-225 as the alpha source for the RPT trial of the canines. I learned why Pb-212 could be a better radioisotope, as its half-life is ~10 hours, which allows the canines to go home with more ease and less concern of radioactive waste after treatment, whereas this is not the case with Ac-225, which has a half-life of ~9 days. Along with contouring and modeling, I shadowed many meetings, which provided me insight into the daily life of a medical physicist in research as well as the ins and outs of writing and receiving feedback on a grant proposal. Overall, the summer was a great experience that further developed my understanding of medical physics and only increased my interest and passion for the field.

Carlos G. Colon-Ortiz
University of Florida | Senior, Biomedical Engineering

Mentor: Wu Liu, PhD
Stanford University, Department of Radiation Oncology-Medical Physics

Polycapillary optics application in a kV X-ray scattering

This project involved special knowledge in optical physics concepts like total external reflection to assess photon bouncing within the tube arrays of the polycapillary device. Polycapillary optics are made using a hybrid lens that combines a collimating lens and a focusing lens placed together in the system. My main objective for this project was to perform various MATLAB simulations to study the effects that the values of the different parameters (like lens diameter, photon energy, the distance of the beam, among others) changed the focus of the X-rays injected into the region of interest (ROI) with only a few millimeters in diameter. With this project we were able to tune simulation parameters to improve our output setup for the simulation of the polycapillary optic prototype design. This fellowship experience help me realize the important crosslink of AI with medical physics applications and how to effectively use programming as a tool for innovation in the field.

Wilson Delmas
Queens College | Senior, Physics, Philosophy

Mentor: Ashley Tao, PhD
Gundersen Health System, Diagnostic Imaging

Computed tomography (CT) ACR phantom

The project goal was to be able to perform most American College of Radiology quantitative measurements in an automated or semi-automated fashion using MATLAB. It made extracting data from DICOM images less tedious, efficient, and less time consuming. My mentor and I worked on creating a draft for the logic we can use before coding. Afterward, using MATLAB's image processing, we were able to start writing our code. We were able to successfully create a code that can sift through a folder with many DICOM files and extract them to be analyzed. Using some image processing tools like masking, the code was able to tell us the CT number accuracy. I have learned how much I don't know. Most of my time was spent with my mentor working on our code. That experience introduced me to image processing, specifically for DICOM images. Other time was spent shadowing various medical imaging techniques used in treatment planning. I now have a little deeper understanding of how some of the various models work and why they must be often checked. I now have a greater appreciation for the various modalities used in treatment planning.

Beatriz Guvera
University of Miami | Senior, Biomedical Engineering

Mentor: Lijun Ma, PhD
University of California San Francisco, Department of Radiation Oncology

Develop a low-cost, universal, end-to-end extended Winton-Lutz test method

I am currently in my senior year of Biomedical Engineering at University of Miami. I was part of the DREAM fellowship program, and it was one of the greatest experiences of my academic career. I learned and discover new topics of Research and possibilities in the medical physics field, which expanded my knowledge and curiosity on this topic. During my internship my research experience focused on facilitating the implementation of frameless single-isocenter multitarget steriotactic radiosurgery (SRS) program by developing a low-cost, universal, end-to-end extended Winton-Lutz test method. The path to this objective was to create a two-piece detachable plastic film slab to test isocenter coincidence. We use Matlab program to find the center of mass of an isodensity plot and compare it with the marker position. Having the opportunity to meet new people in the medical physics field has been of great privilege. I could say that this fellowship changed my academic path to a better and brighter future, and it has positively impacted my life. As a Hispanic, first generation student I am grateful to AAPM and Dr. Ma for taking me in and teaching me about Medical Physics.

Joana Hadzhilazova
Pacific Lutheran University | Senior, Physics, Biomedical Engineering

Mentor: MingDe Lin, PhD
Yale University, School of Medicine, Yale Interventional Oncology Research Lab

Quantitative multimodal image guidance for improved liver cancer treatment

Last summer, I had the pleasure of interning through the DREAM Fellowship Mentoring Program at the Yale Interventional Oncology Research Lab (Yale University School of Medicine) studying interventional oncology techniques for treating liver cancer. I worked in a virtual setting under the guidance of my advisors Drs. Julius Chapiro, David Madoff, and MingDe Lin, together with two other undergraduate students, Stephanie Lynn Silin and Zauraiz Siddiqi. Our goal was to develop a machine learning-based algorithm and use existing patient data (CT scans) to train the AI-based system to determine whether a patient with primary liver cancer will benefit from undergoing Portal Vein Embolization (PVE). This will be a valuable asset that may minimize the uncertainty associated with treating liver cancer. The first steps included performing file conversions between off, vtk, and NIfTI, which was perhaps the most difficult step as off is a legacy industry proprietary file format. Although the summer internship timeline has concluded, I decided to stay with the team and contribute to the best of my ability as I continue to learn and explore this field. I am forever grateful for this opportunity and am excited to see how this project evolves.

Erika Jank
Creighton University | Junior, Biomedical Physics

Mentor: Carri Glide-Hurst, PhD
University of Wisconsin, School of Medicine and Public Health, Department of Human Oncology

Robust treatment planning

The purpose of my project was to quantify the impact of using robust treatment planning for cardiac substructure sparing. This is important because of the negative effects of cardiotoxicity that occur when too much radiation is received by that area. Conventional whole heart metrics are becoming less useful, and dose limits should be evaluated based on the sensitivities and displacements due to breathing of the various cardiac substructures. My project involved utilization of the RayStation software to create robustly optimized treatment plans on eight breast cancer patients. This showed how dosage to vital substructures of the heart could be reduced compared to the conventional way of addressing uncertainty in planning. It was discovered that using robust optimization led to better dose conformity, reduction of normal tissue irradiation, increased tolerance of inter-fraction and intra-fraction variation, and better predictability of the dose distribution. This fellowship not only taught me so much more about radiation therapy treatment planning, but also provided me with numerous opportunities to observe what working in this field would entail.

Baylie Jensen
University of California, Riverside | Senior, Physics

Mentor: Adam S. Wang, PhD
Stanford University, Department of Radiology

Improving CT image quality via tube voltage modulation

My project used tube voltage modulation to improve CT images while reducing radiation. Reducing radiation exposure is crucial as overexposure can pose serious and harmful effects on your overall health. I first conducted research to find the optimal energy value for a CT phantom. Once I found this value, I then scanned the phantom to determine the SNR value. The next step was to create a tube voltage modulated scan, a scan in which the tube voltage is modulated based on specific parts of the body. For example, the stomach tissue has a lower voltage value than the pelvis area where there is a large amount of bone. After proving successful with the tube voltage modulated scan, I then applied it to a pelvic CT phantom. After comparing a fixed kVp scan with the tube voltage modulated scan, both on a pelvis phantom, I found that the tube voltage modulated scan resulted in a higher SNR value. This proved that we can reduce radiation exposure while simultaneously improving the quality of a CT image. Being able to conduct research has given me a new perspective and motivation towards research. I had the opportunity to be at the cusp of a new discovery and I am eager to continue conducting research to further improving CT image quality.

Sara Zeidan
Michigan State University | Junior, Physics

Mentor: Andrea Ferrero, PhD
Mayo Clinic, Department of Radiology

Robustness of image quality metrics applied to AI-based reconstructions of CT data

Having the privilege to work with Dr. Ferrero and Dr. Favazza this summer was an extremely enriching experience. I had the opportunity to explore different AI-based reconstruction algorithms in CT with my mentors. We were determining image quality metrics in CT, which involved quantitively evaluating those metrics, such as calculating the contrast to noise ratio (CNR) and the noise power spectrum (NPS) of images. The objective of my study was to investigate if those metrics are robust to AI-based image reconstruction algorithms. I was introduced to the idea of phantom (test objects) utilization and how it became significantly efficient in terms of dose optimization test acquisitions. With those phantom images available for our use, we are able to determine IQ metrics of certain doses under certain recons which include: FBP, AIDR, AICE BODY, AICE BODY SHARP. I worked on this project using Python, which helped me attain significantly more reliable data in comparison to calculating by hand. We were able to conclude that certain recons had similar performance in terms of IQ with dose reduction. With the CNR results we had seen that AICE body 75% dose has similar performance as AIDR 100%, suggesting that reductions in dose by 25% can be performed without a major IQ compared to what is used clinically, AIDR 100%. I hope to further extend my knowledge by revisiting my code in the future and making better sense of my conclusions with the growth of my Physics career.

Nahom Zewde
Earlham College | Senior, Biochemistry

Mentor: Madan Rehani, PhD
Massachusetts General Hospital, Department of Radiology

Organ doses and cancer risk assessment in patients exposed to high doses from recurrent CT exams

I worked under Dr. Madan Rehani to estimate attributable cancer mortality risks (LACMR) in patients who were exposed to high doses of ionizing radiation from recurrent CT exams. Radiation protection in clinical settings has been a hot topic in the past few decades, and research projects like ours help create awareness about radiation exposure and protection. After the collection of patient data, we used a relative risk model and mathematical coding to estimate LACMR. Finding from our research project is submitted to the European Journal of Radiology and is currently under review. My, PI, Dr. Rehani, has trained me to be a well-equipped scientist. Despite my lack knowledge at the beginning of the research project, he has been incredibly nurturing, while still making sure I gain the most out of this experience. He has also all owed me to work under him on other projects that are related to radiation protection policy.

Kristiana Ramos
University of Maryland | Junior, Physics

Mentor: Mark H. Phillips, PhD
University of Washington, Department of Radiation Oncology

Paul Teng
Johns Hopkins University | Junior, Physics

Mentor: Grace Jianan Gang, PhD
Johns Hopkins University, School of Medicine, Department of Biomedical Engineering

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Medical Physics Journal Best Paper Awards

Farrington Daniels Award

(Funded by the endowed Farrington Daniels Fund)

This award is for an outstanding paper on radiation therapy dosimetry, planning, or delivery published in *Medical Physics* in 2020. Presented in 2020, the awardees were **Conor H. McFadden, Shirin Rahmanian, David B. Flint, Scott J. Bright, David S. Yoon, Daniel J. O'Brien, Aroumougame Asaithamby, Amir Abdollahi, Steffen Greilich,** and **Gabriel O. Sawakuchi** for their paper entitled "Isolation of time-dependent DNA damage induced by energetic carbon ions and their fragments using fluorescent nuclear track detectors," *Medical Physics* 2020; 47:1:272-281.

Moses and Sylvia Greenfield Award

(Funded by the endowed Moses and Sylvia Greenfield Fund)

This award is for an outstanding paper on imaging, published in *Medical Physics* in 2020. Presented in 2021, the awardees were **Ran Zhang, Amy M. Fowler, Lee G. Wilke, Frederick Kelcz, John W. Garrett, Guang-Hong Chen, and Ke Li** for their paper entitled "Fast acquisition with seamless stage translation (FASST) for a trimodal x-ray breast imaging system," *Medical Physics* 2020; 47:9:4356-4362.

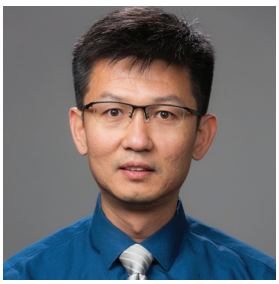
Journal of Applied Clinical Medical Physics (JACMP) Best Paper Awards

(Funded by the endowed JACMP Editors' Fund)

Michael D. Mills Editor In Chief Award

This award is for an outstanding general medical physics article published in *JACMP* in 2020. Presented in 2021, the awardees were **Daniela Poppinga, Jana Kretschmer, Leonie Brodbek, Jutta Meyners, Bjoern Poppe,** and **Hui Khee Looe** for their paper entitled "Evaluation of the RUBY modular QA phantom for planar and non-coplanar VMAT and stereotactic radiations," *J Appl Clin Med Phys* 2020; 21:10: 69–79.

George Starkschall Award



This award is for an outstanding radiation oncology physics article published in the *JACMP* in 2020. Presented in 2021, the awardees were **Yunfeng Cui, Hao Gao, Jiahan Zhang, John P. Kirkpatrick,** and **Fang-Fang Yin** for the paper entitled "Retrospective quality metrics review of stereotactic radiosurgery plans treating multiple targets using single-isocenter volumetric modulated arc therapy," *J Appl Clin Med Phys* 2020; 21:6:93–99.

Peter R. Almond Award

The Peter R. Almond Award of Excellence is for an outstanding radiation measurements article published in *JACMP* in 2020. Presented in 2021, the awardees were **Owen J. Brace, Sultan F. Alhujaili, Jason R. Paino, Duncan J. Butler, Dean Wilkinson, Brad M. Oborn, Anatoly B. Rosenfeld, Michael L. F. Lerch, Marco Petasecca,** and **Jeremy A. Davis** for their paper entitled "Evaluation of the PTW microdiamond in edge-on orientation for dosimetry in small fields," *J Appl Clin Med Phys* 2020; 21:8:278–288.

Edwin C. McCullough Award

The Edwin C. McCullough Award of Excellence is for an outstanding medical Imaging physics article published in the *JACMP* in 2020. Presented in 2021, the awardees were **Jeffrey E. Snyder, Joel J. St-Aubin, Sridhar Yaddanapudi, Amanda Boczkowski, David A.P. Dunkerley, Stephen A. Graves,** and **Daniel E. Hyer** for their paper entitled "Commissioning of a 1.5T Elekta Unity MR-linac: A single institution experience," *J Appl Clin Med Phys* 2020; 21:7: 160–172).

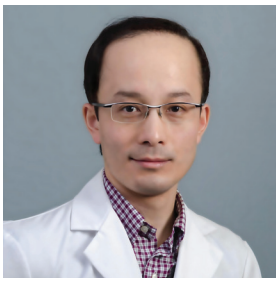
Jack Fowler Early-Career Investigator Award

(Funded by the Jack Fowler Award Fund)

This award was established in honor of Jack Fowler, PhD, Emeritus Professor of Human Oncology and Medical Physics, University of Wisconsin. The award was presented to **Tess Reynolds, PhD,** Postdoctoral Research Fellow, University of Sydney, for the top scoring abstract submitted by Early-Career Investigators who entered the competition, entitled "Imaging From the Cervical to the Lumbar Spine with a Continuous Multi-Turn Reverse Helical 3D Cone-Beam CT Scan."

Jack Krohmer Early-Career Investigator Award

(Sponsored by the AAPM Science Council through the AAPM Education & Research Fund)



This award was established in honor of Jack Krohmer, PhD, a pioneer in the medical physics community. The award was presented to **Sang Ho Lee, PhD**, Senior Research Investigator in the Department of Radiation Oncology, University of Pennsylvania, for the best abstract submitted by Early-Career Investigators to the Scientific Program of the AAPM Annual Meeting, judged according to criteria of significance, innovation, and the potential for major scientific impact in an area of cutting-edge interest in medical physics. The abstract was entitled "Multi-Group Multi-Block Data Integration for Harmonizing 18F-FDG-PET/CT Radiomics Associated with Circulating Tumor Cells and Predicting Recurrence-Free Survival Across Independent Lung Cancer Radiotherapy Studies."

Award for Innovation in Medical Physics Education *(Funded by the Harold Marcus Fund)*

This award is given for the best presentation at an Education Council session concerning innovative programs in medical physics education of physicists, physicians, ancillary personnel, and the public. Presentations can be concerned with scientific research, novel teaching strategies (team teaching or adult learning efforts), or novel educational materials (lectures, websites, or other innovations). This year's award went to **Adam C. Riegel, PhD**, Northwell Health, for a presentation entitled, "Cooperative Education in a Medical Physics Masters Graduate Degree Program."

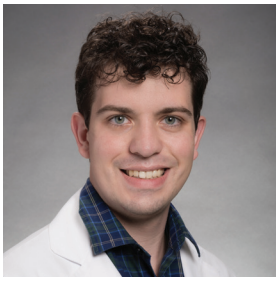
John R. Cameron Early-Career Investigators Symposium Award

(Funded by the endowed John Cameron Fund)

The Early-Career Investigators Symposium is a competition in honor of University of Wisconsin Professor Emeritus John R. Cameron, PhD and John R. Cunningham, PhD, from Princess Margaret Hospital, and subsequently from the University of Alberta. The 10 highest scored abstracts submitted for the Symposium are selected for presentation, from which the top three presentations receive awards. 2021 winners were:

1st Place
Yiqun (Quinn) Ma
Johns Hopkins University, Department of Biomedical Engineering
PhD Student in Biomedical Engineering
"Non-Circular Orbits On a Clinical Robotic C-Arm for Reducing Metal Artifacts in Orthopedic Interventions"

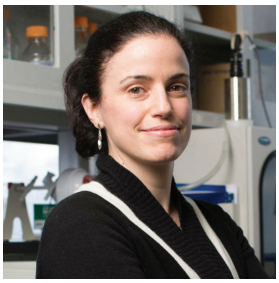
2nd Place
Nolan Esplen
University of Victoria, Department of Physics and Astronomy
PhD Student in Medical Physics
"Design and Performance of the ARIEL X-Ray FLASH Irradiation Platform at TRIUMF"



3rd Place
Evan Gates, PhD
University of Washington, Department of Radiation Oncology
Medical Physics Resident
"Imaging Based Prediction of Proliferative Foci as a Target for Surgical Intervention Across Glioma Grades"

Carson/Zagzebski Distinguished Lecture On Medical Ultrasound

(Funded by the endowed Carson/Zagzebski Fund)



On Wednesday, July 28 at the AAPM 2021 Virtual Annual Meeting, invited lecturer **Elisa Konofagou, PhD**, Robert and Margaret Hariri Professor of Biomedical Engineering and Professor of Radiology (Physics) at Columbia University, delivered her lecture, "*Ultrasound-based Neurotherapeutics and Imaging of Cardiovascular Disease and Cancer*."

The Anne and Donald Herbert Distinguished Lectureship in Modern Statistical Modeling

(Funded by the endowed Anne and Donald Herbert Fund)

On Tuesday, July 27 at the AAPM 2021 Virtual Annual Meeting, invited lecturer **Nancy Obuchowski, PhD**, Professor of Medicine at Case Western Reserve University and Vice Chairman of Department of Quantitative Health Sciences at Cleveland Clinic Lerner Research Institute, delivered her lecture, "*Importance of Quantitative Imaging Biomarkers' Technical Performance Characteristics in Designing and Analyzing Clinical Trials*."

Science Council Associates Mentorship Program Recipients

- **Rachel Ger, PhD**
  Instructor
  Johns Hopkins University
  Department of Radiation Oncology and Molecular Radiation Sciences

  Mentor: Geoffrey Hugo, PhD,
  Professor and Director,
  Medical Physics
  Washington University School of Medicine

- **Michelle Howard, PhD**
  Assistant Professor
  University of Iowa
  Department of Radiation Oncology

  Mentor: Magdalena Bazalova-Carter, PhD
  Associate Professor
  University of Victoria

- **Arthur Lalonde, PhD**
  Medical Physics Resident
  Massachusetts General Hospital / Harvard Medical School
  Department of Radiation Oncology, Physics Division

  Mentor: Amit Sawant, PhD
  Professor and Vice Chair for Medical Physics
  University of Maryland School of Medicine

- **Qihui Lyu, PhD**
  Medical Physics Resident
  University of California, Los Angeles
  Department of Radiation Oncology

  Mentor: Qing-Rong (Jackie) Wu, PhD
  Professor
  Duke University Medical Center

- **Haidy Nasief, PhD**
  Medical Physics Resident
  Medical College of Wisconsin
  Department of Radiation Oncology

  Mentor: Eric Ford, PhD
  Professor, Director and Vice-Chair of Medical Physics
  University of Washington

- **Phillip Wall, PhD**
  Medical Physics Resident
  University of California, San Francisco
  Department of Radiation Oncology

  Mentor: Kevin Moore, PhD
  Associate Professor
  University of California, San Diego

- **Shu Xing, PhD**
  Medical Physics Resident
  Massachusetts General Hospital / Harvard Medical School
  Department of Radiation Oncology, Physics Division

  Mentor: Rebecca Howell, PhD
  Professor
  University of Texas MD Anderson Cancer Center

- **Afua Yorke, PhD**
  Medical Physics Resident
  University of Washington
  Department of Radiation Oncology

  Mentor: Kristy Brock, PhD
  Professor
  University of Texas MD Anderson Cancer Center

AAPM Science Council Associates Mentorship Program

AAPM Science Council Associates Mentorship Program has been established to recognize and cultivate outstanding researchers at an early stage in their careers with the goal of promoting a long-term commitment to science within AAPM. The program uses the process of "shadowing" to integrate the Associates into the scientific activities of the organization. Science Council Associates participate in the program for one year, and are funded up to $4,000 per Associate (to cover travel costs including flight, hotel, and meeting registration) to attend two consecutive AAPM Annual Meetings, including the pre-meeting activities associated with each Committee.

Sponsored by the AAPM Science Council through the AAPM Education & Research Fund (See AAPM website for more details, including eligibility requirements.)

AAPM Expanding Horizons Travel Grants

AAPM Expanding Horizons Travel Grants are awarded twice annually. As many as ten grants, each up to $1,000, are given for the purpose of providing additional support for student and trainee travel to conferences that are not specifically geared toward medical physics. The travel grant is designed to provide an opportunity to broaden the scope of scientific meetings attended in order to introduce students and trainees to new topics which may be of relevance to medical physics research and which may subsequently be incorporated into future research in order to progress the field in new directions.

Sponsored by the AAPM Science Council through the AAPM Education & Research Fund (See AAPM website for more details, including eligibility requirements.)

Summer School Tuition Scholarships

Summer School Tuition Scholarships are in the form of a full waiver of tuition fees for the entire AAPM 2021 Summer School. This award is available to applicants who are in the first five years of their careers in medical physics.

Sponsored by the AAPM Administrative Council through the AAPM Education & Research Fund (See AAPM website for more details, including eligibility requirements)

AAPM Expanding Horizons Travel Grant Awardees

Round 1

- **Nitish Chopra, PhD**
  Radiation Oncology Medical Physics Resident
  The University of Texas MD Anderson Cancer Center, Department of Radiation Physics
  Neural Information Processing Systems (NeurIPS)
- **Maduka M. Kaluarachchi, PhD**
  Medial Physics Resident
  Warren Alpert Medical School, Brown University/Rhode Island Hospital, Department of Radiation Oncology
  American Physical Society (APS) April Meeting

NOTE: In 2021, Round 2 grants were not awarded.

Summer School Tuition Scholarship Recipients

- **Tirthraj Adhikari, MSc**
  Sushil Koirala Prakhar Cancer Hospital
  Radiation Oncology
- **Daniel Hernandez, PhD**
  University of California, Davis Medical Center
  Radiation Oncology
- **Borna Maraghechi, PhD**
  Washington University School of Medicine
  Radiation Oncology
- **Patricia Oliver, PhD**
  Cross Cancer Institute
  Medical Physics
- **Andrew Santoso, PhD**
  University of Colorado Anschutz Medical Campus
  Radiation Oncology
- **Shima Yaghoobpour Tari, PhD**
  Cross Cancer Institute
  Medical Physics

Team BEST®/AAPM Awards

TeamBest® provides funding for five fellowships in the amount of $1,000 each, to be used for travel, food and lodging expenses to attend the Annual Meeting. AAPM provides complimentary Annual Meeting registration for each recipient, including social functions. TeamBest® also provides a plaque for each of the five fellowship recipients.

Sponsored by TeamBest® through the AAPM Education & Research Fund

This award is traditionally presented each calendar year. However, for 2021 doing so was paused as a result of rapidly escalating health concerns relating to the spread of the coronavirus disease (COVID-19) and how its resultant impact made this specific award infeasible.

The AAPM Development Committee uses this report to convey important activities supported by our Education & Research (E&R) Fund, which would not be possible without your thoughtful donations. ***We hope you share our joy*** in how the E&R Fund is used to promote medical physics research, support education of future medical physicists, and recognize outstanding medical physicist accomplishments.

For those interested in E&R Fund data, its current state is healthy and is described in the bar graphs below, showing its balances at the end of 2021, revenues for 2021, and member contributions for 2021. To maintain and expand our important E&R Fund activities, your Development Committee aims to continue growing our E&R Fund.

To that end, each member is encouraged to contribute to one or more of the AAPM E&R Fund portfolio options, whichever best suits your passion (see https://www.aapm.org/education/edfundlinks.asp). I am pleased to report that AAPM has expanded and extended one popular giving option (Policy AP95) through 2026. AAPM now matches donations to the E&R Fund (up to $500,000 in total) for any members donating at least $2,500, either through a one-time donation or a five-year or less pledge. Also, for such donations your donor level will immediately reflect the total amount pledged plus the total amount matched.

Other notable options include, but are not limited to, memorial gifts (Policy AP99), named fund gifts (Policy AP6), and future legacy gifts (Policy AP18), the latter having $5,000 matching. Whatever your passion, however you might give, please keep your AAPM in mind!

There are different ways to donate, and some can be more financially favorable than others. Whether giving to the AAPM or other charitable organizations, the AAPM provides member education on giving options through its Planned Giving website (https://aapm.myplannedgift.org/).

Our members and awardees truly appreciate and thank you for your support! On the following pages is a listing of the approximately 1800 members, companies, and professional societies who have given to our E&R Fund.

Kenneth R. Hogstrom, PhD
Chair, AAPM Development Committee

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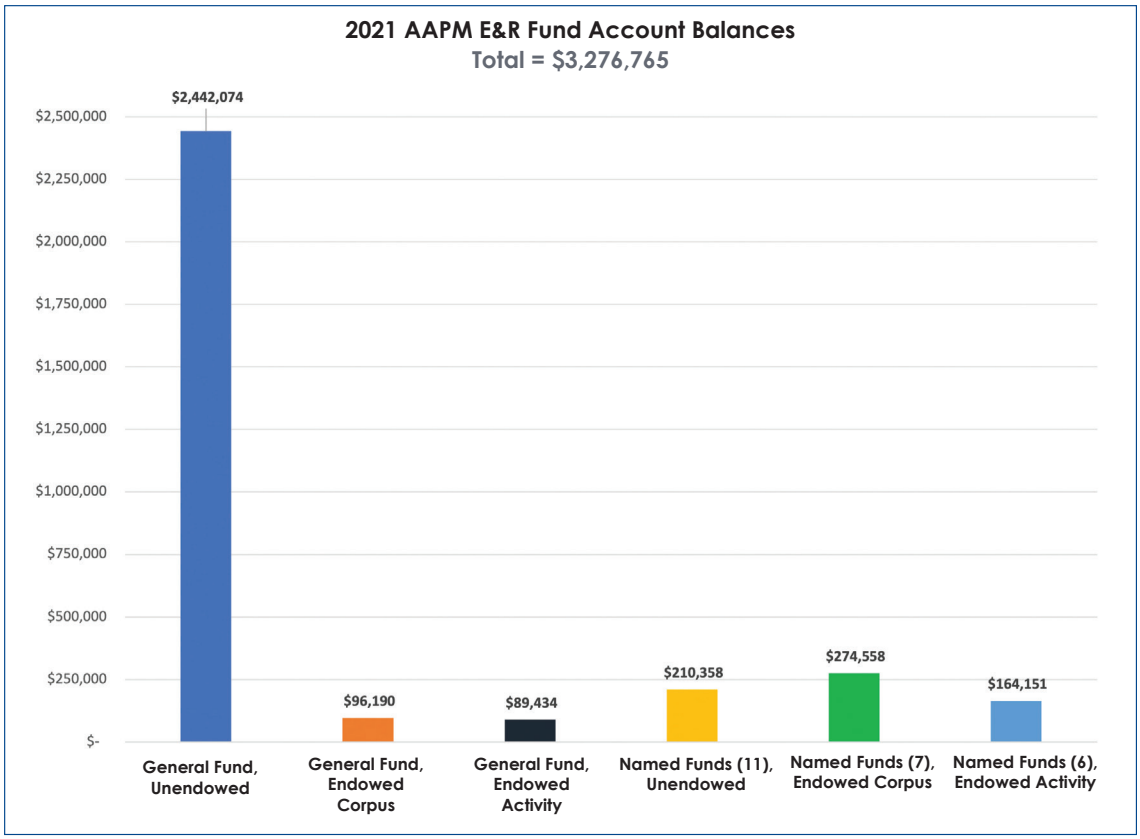

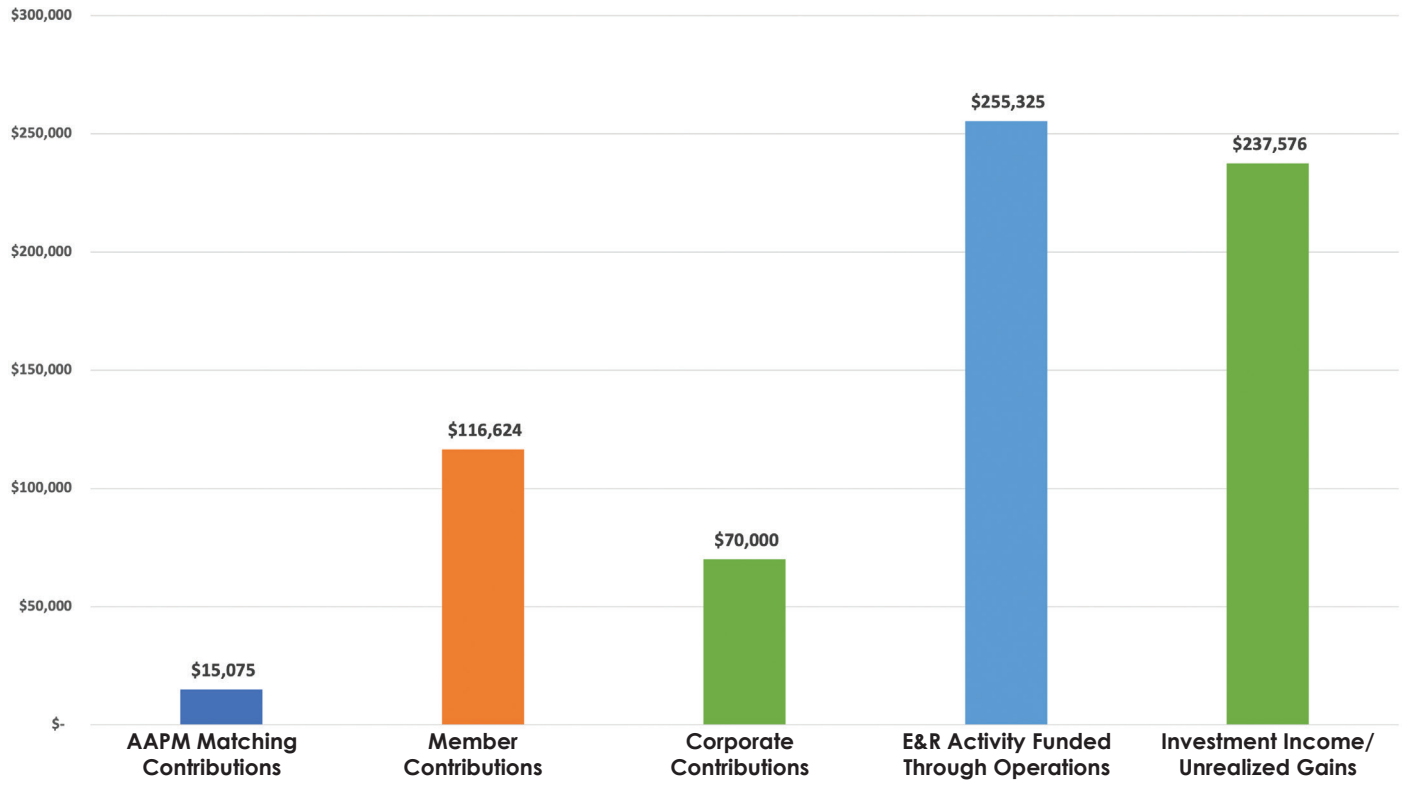

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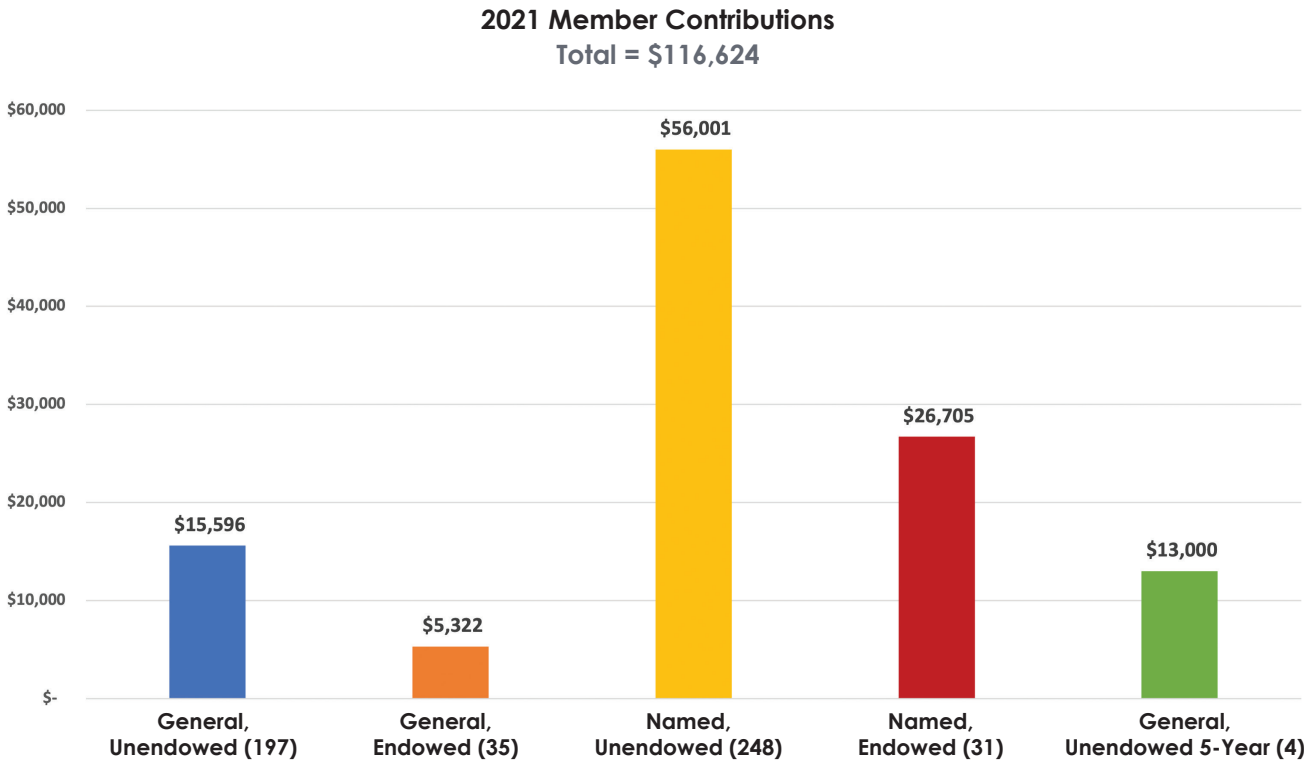

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