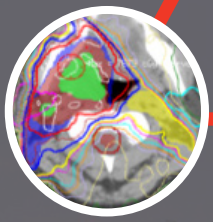


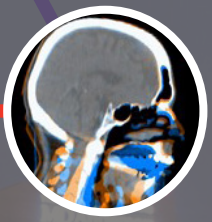
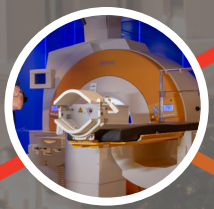
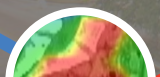


Image-Guided Cancer Therapy Research Program

FY 2023 Program Update

THE UNIVERSITY OF TEXAS
MD Anderson Cancer Center
Making Cancer History®





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A Note from IGCT Director: Dr. Kristy Brock

Hello IGCT Community!

It's amazing to compile these annual program updates and see the remarkable progress and achievements of the Image Guided Cancer Therapy Research Program faculty and staff! Thank you to our 88 brilliant faculty who are committed to the mission and vision of this program. Our mission, to empower multidisciplinary teams to address clinical challenges and technology barriers, has been achieved through several new investigator-led grants, including Dr. Hutcheson's NCI R01 on the dissemination and implementation of DIGEST to provide evidence-based measurements of dysphagia, Dr. Ost's NCI R44 funded multicenter study combining bronchoscopy and Stimulated Raman Histology with AI for rapid lung cancer detection, Drs. Koong and Gan's NCI U54 on acquired resistance to therapy and Iron, and Drs. Quarles and Yankeelov's NCI R01 on imaging-based tumor forecasting to predict brain tumor progression and response to therapy.

We have also seen significant progress towards our vision of local regional tumor control and reduced toxicities. Dr. Court's Radiation Planning Assistant, which expands low-cost tools to improve the planning and delivery of radiation therapy to cancer patients in low and middle- income countries, received FDA 510(k) clearance in May 2023 and has now officially launched in South Africa! Dr. Wu and his multidisciplinary collaborators have developed and validated an ensemble deep learning model to predict overall survival and progression-free survival following treatment factors, paving the way to further personalize treatment.

Dr. Koay's cross-disciplinary team launched an open-label phase I clinical trial investigating the safety and tolerability of nab- paclitaxel with concurrent chemoradiation for pancreatic cancer which demonstrated the prognostic value of a CT-based response biomarker to better stratify patients. And Drs. Sokolov and Schwartz-Duval demonstrated groundbreaking advances int the biosyntethesis of gold nanoclusters to overcome delivery barriers to radiosensitization.

This year we welcomed four new investigators to the IGCT program, Drs. Wintermark, Hansel, Yuan, and Tang! We are excited to collaborate with them on a variety of exciting projects. Our Seminar and Workshops, with CME credit, have featured a wide range of exciting topics from outstanding speakers from inside MD Anderson as well as around the world. These are recorded in case you miss them! We had two exciting initiatives this year focused on our mentorship aim including a grant mentoring program with the Department of Breast Imaging and a summer undergraduate research program, DI-STEP. Both were very successful! Just a reminder – our IGCT T32 Training Program continues to recruit outstanding postdoctoral fellows and our IGCT staff and resources continue to grow – check out the information within this update and on the website! Thank you to the IGCT staff who support so many of these collaborative efforts!

Finally, a huge thank you to Dr. Kari Brewer Savannah for her work and dedication as the Program Director for the IGCT!

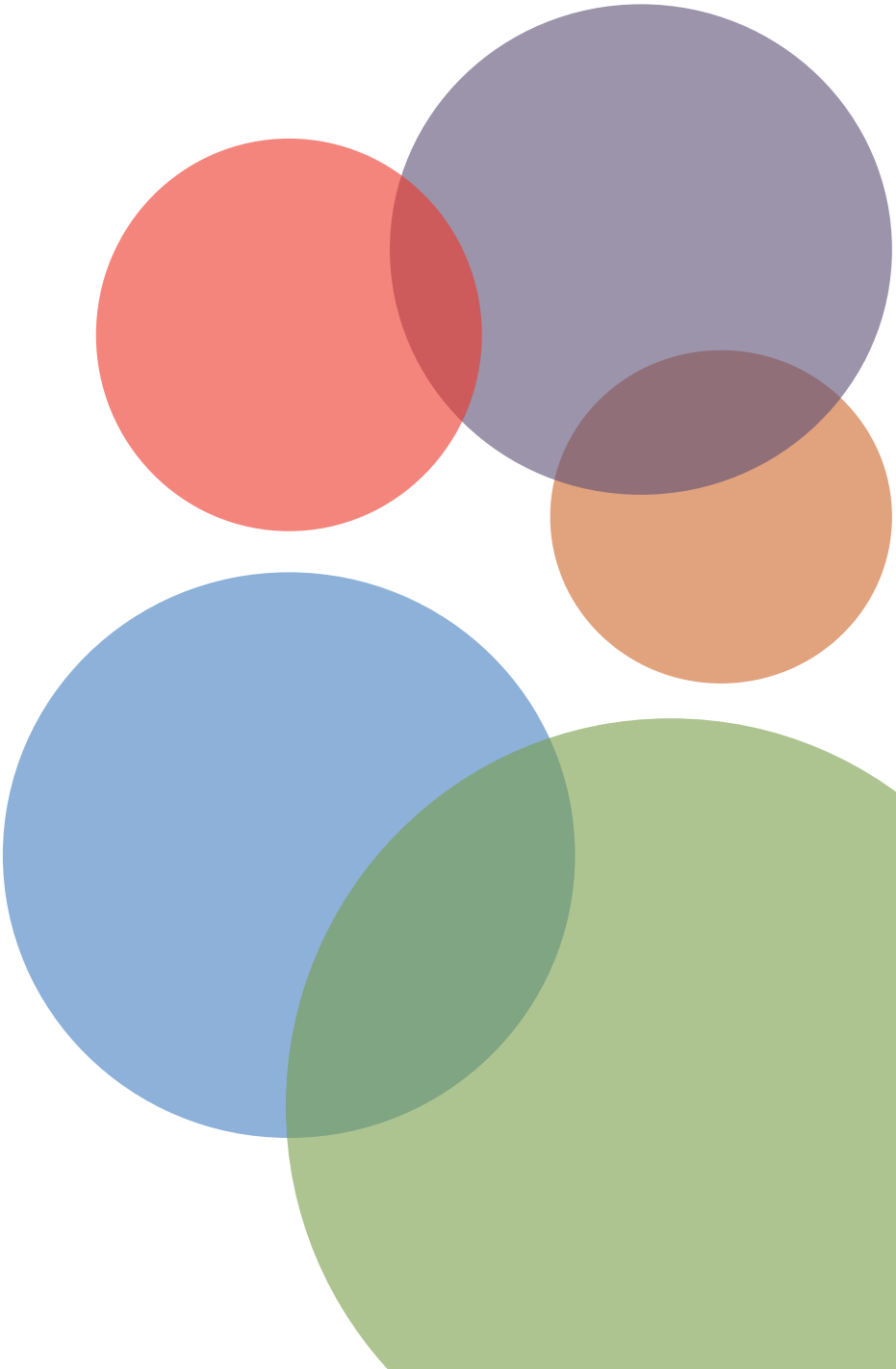
A Note from IGCT Program Director: Kari Brewer Savannah, Ph.D.

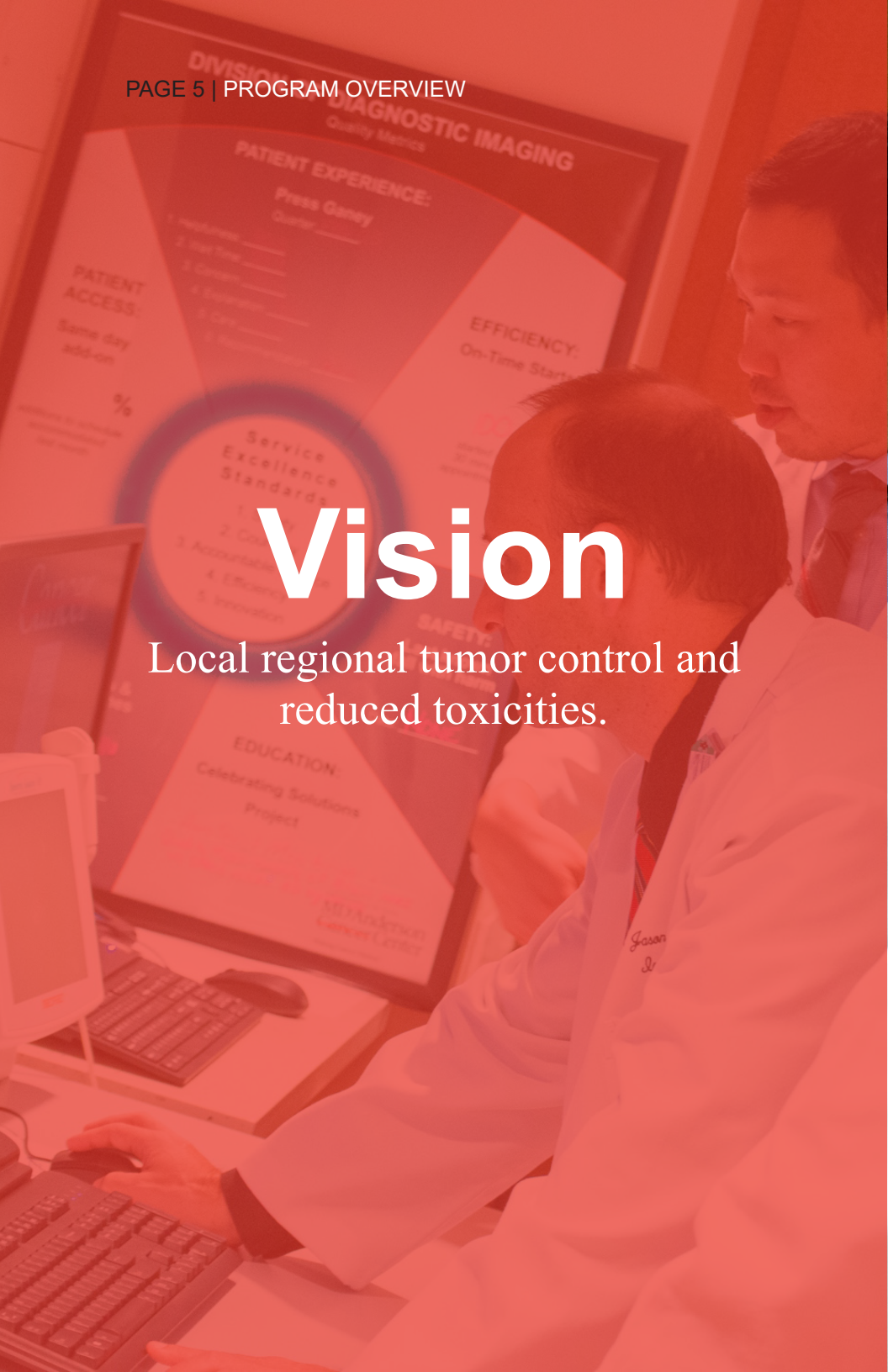
Reflecting on the past year, I am grateful for the opportunity to have continued serving as the Program Director for the Image Guided Cancer Therapy (IGCT) Research Program and to have helped drive the mission and vision of this impactful program forward. We are excited about several notable accomplishments this year, including launching two funded research mentoring initiatives, one for faculty and the other for undergraduate students, that furthered our strategic goal to provide mentorship in developing multi-disciplinary research and grant-writing. We welcomed four new faculty to the IGCT Program, and celebrated alongside our IGCT investigators as their impactful research earned recongnition through peer-reviewed grants, high level publications, and successful clinical trials. We added two new postdoctoral fellows to our IGCT T32 Program, and developed several educational resources and tools that we will unveil in FY2024, including a short course on imaging. One of the things I love most about working in the IGCT is witnessing the many fruitful collaborations and outstanding research that is being done by IGCT investigators. Helping to administratively support, or even just having the opportunity to help recognize and highlight these major and impactful accomplishments is exciting and fullfilling. Congratulations to all on a great and productive year!

Kari Brewer Savannah

FY 2023 IGCT Program Highlights:

- Two pilots focused on research mentoring were launched with funding.
- The IGCT hosted 12 seminars and a record breaking 6 workshops.
- Four investigators were welcomed to the IGCT along with several new research staff.





Vision

Local regional tumor control and reduced toxicities.

Mission

Empower multidisciplinary teams of physicians and scientists to address clinicial challenges and technology barriers enabling the translation of innovative science directly to patient care.

Program Overview

The Image Guided Cancer Therapy Research Program's vision to harness the synergy of multidisciplinary teams has enabled the acceleration of innovation and its translation to the clinical environment. The program relies heavily on the expertise of its members - interventional and diagnostic radiologists, imaging scientists, medical physicists, surgeons, radiation oncologists, pathologists, and more. Through increased 'clinical problem' focused interactions clinical limitations are identified, solutions designed, and clinical trials initiated. These initiatives make strides towards improving patient care.

Kristy K. Brock, Ph.D., DABR, FAAPM
Director

Clifton D. Fuller, M.D., Ph.D., DABR
Medical Director, Radiation Oncology Branch

Bruno C. Odisio, M.D., DABR
Medical Director, Interventional Radiology Branch

Kari Brewer Savannah, Ph.D.
Program Director

Jeffrey S. Weinberg, M.D., FAANS, FACS
Medical Director, Surgical Oncology Branch





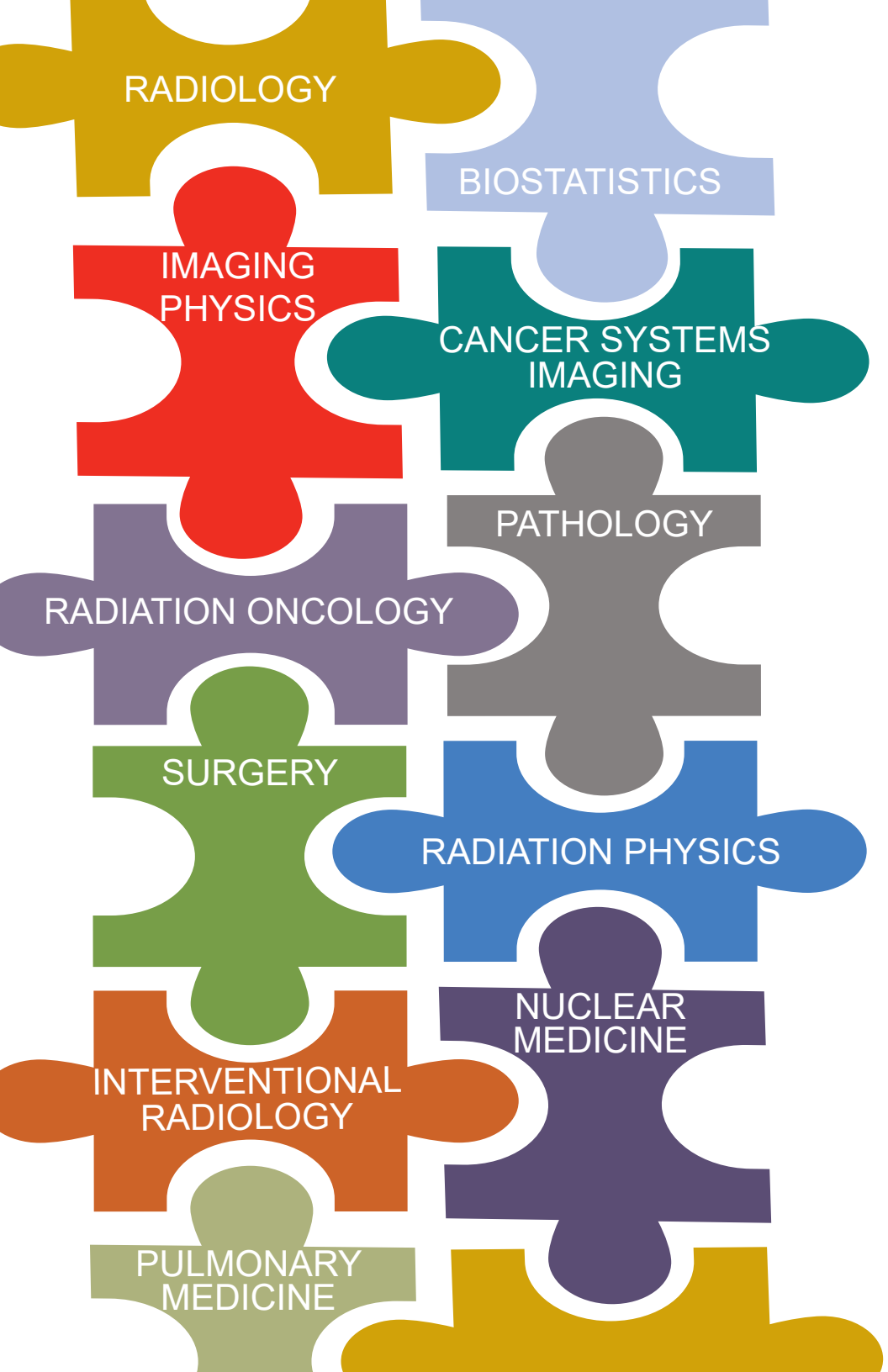
Strategic Goals

1. Develop and validate novel imaging to identify and target the tumor while avoiding normal tissue.

2. Advance in-room integration of imaging to reduce uncertainties in executing the planned intervention.

3. Demonstrate a significant improvement in the local control and quality of life of cancer patients through image guided cancer therapy.

4. Provide mentorship in developing multi-disciplinary research and grant writing.


RADIOLOGY
BIOSTATISTICS
IMAGING PHYSICS
CANCER SYSTEMS IMAGING
PATHOLOGY
RADIATION ONCOLOGY
SURGERY
RADIATION PHYSICS
NUCLEAR MEDICINE
INTERVENTIONAL RADIOLOGY
PULMONARY MEDICINE

Imaging Physics
James A. Bankson, Ph.D.
Richard R. Bouchard, Ph.D.
Kristy K. Brock, Ph.D.
David T. Fuentes, Ph.D.
John D. Hazle, Ph.D.
Ken-Pin Hwang, Ph.D.
Kyle A. Jones, Ph.D.
Cheenu S. Kappadath, Ph.D.
Rick R. Layman, Ph.D.
Ho-Ling A. Liu, Ph.D.
Jingfei Ma, Ph.D.
Osama R. Mawlawi, Ph.D.
Tinsu Pan, Ph.D.
Jeffery H. Siewerdsen, Ph.D.
Konstantin V. Sokolov, Ph.D.
R. Jason Stafford, Ph.D.
Tien Tang, Ph.D.
Jia Wu, Ph.D.

Cancer Systems Imaging
H. Charles Manning, Ph.D.
Mark D. Pagel, Ph.D.
David Piwnica-Worms, M.D., Ph.D.
C. Chad Quarles, Ph.D.

Nuclear Medicine
Yang Lu, MD, Ph.D.
Gregory C. Ravizzini, M.D.

Pathology
Alejandro Contreras, M.D., Ph.D.
Donna E. Hansel, M.D., Ph.D.
Savitri Krishnamurthy, M.D.
Anirban Maitra, M.B.B.S.
Yinyin Yuan, Ph.D.

Interventional Radiology
Rony Avritscher, M.D.
Stephen R. Chen, M.D.
Erik N. K. Cressman, M.D., Ph.D.
Sanjay Gupta, M.D.
Peiman Habibollahi, M.D.
Bruno C. Odisio, M.D.
Rahul A. Sheth, M.D.
Alda L. Tam, M.D., M.B.A.

Pulmonary Medicine
Roberto F. Casal, M.D.
George A. Eapen, M.D.
David E. Ost, M.D., M.P.H.

Biostatistics
Suprateek Kundu, Ph.D.

Radiation Oncology
Joe Y. Chang, M.D., Ph.D.
Caroline C. Chung, M.D.
Steven J. Frank, M.D.
Clifton D. Fuller, M.D., Ph.D.
Amol J. Ghia, M.D.
Emma B. Holliday, M.D.
Ann H. Klopp, M.D., Ph.D.
Eugene J. Koay, M.D., Ph.D.
Albert C. Koong, M.D., Ph.D.
Lilie L. Lin, M.D.
Steven H. Lin, M.D., Ph.D.
Jack Phan, M.D., Ph.D.
Chad Tang, M.D.
James W. Welsh, M.D.

Radiation Physics
Sam Beddar, Ph.D.
Laurence E. Court, Ph.D.
David A. Jaffray, Ph.D.
Radhe Mohan, Ph.D.
Mohamed R. Salehpour, Ph.D.
Gabriel O. Sawakuchi, Ph.D.
Jihong Wang, Ph.D.
Jinzhong Yang, Ph.D.

Surgery
Justin E. Bird, M.D.
Hop S. Tran Cao, M.D.
Ann M. Gillenwater, M.D.
Neil D. Gross, M.D.
Katherine A. Hutcheston, Ph.D.
Stephen Y. Lai, M.D., Ph.D.
Frederick F. Lang, M.D.
Jeffrey E. Lee, M.D.
Jeffrey N. Myers, M.D., Ph.D.
Yon Son Betty Kim, M.D., Ph.D.
Ravi Rajaram, M.D.
Gregory P. Reece, M.D.
Laurence D. Rhines, M.D.
David C. Rice, M.B., Ch.B.
Andrew G. Sikora, M.D., Ph.D.
Claudio E. Tatsui, M.D.
Jean-Nicholas Vauthey, M.D.
Jeffrey S. Weinberg, M.D.

Radiology
Myrna C.B. Godoy, M.D., Ph.D.
Gaiane M. Rauch, M.D., Ph.D.
Dawid Schellingerhout, MB, ChB
Aradhana M. Venkatesan, M.D.
Max Wintermark, M.D.

Featured IGCT Investigator-Led Grants in FY 2023

Katherine A. Hutcheson, Ph.D.
Professor
Head and Neck Surgery

Dissemination and Implementation of DIGEST™ as an Evidence-Based Measurement Tool for Dysphagia in Cancer

NIH/NCI Funded: R01 CA271223

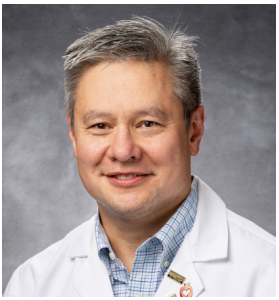
Dr. Kate Hutcheson has dedicated her career to optimizing functional outcomes and quality of life for head and neck cancer survivors with particular emphasis on radiation-associated dysphagia. As a clinician scientist, Dr. Hutcheson is a Professor in the Department of Head and Neck surgery, where she leads an extramurally funded clinical research laboratory serves as Section Chief for Speech Pathology and Audiology. Dr. Hutcheson is a globally recognized pioneer in dysphagia, leading numerous highly impactful studies funded by the NIH, PCORI, DOD, and philanthropic support. Dysphagia is a highly morbid toxicity of cancer with huge implications on quality of life and large burden on the health care system. Widespread integration of evidence-based metrics into clinical diagnostics is the fundamental step needed to personalize and advance dysphagia care. Over the past decade, Dr. Hutcheson and her team have developed DIGEST™ (Dynamic Imaging Grade of Swallowing Toxicity), an NCI CTCAE aligned evidence-based tool for image-based dysphagia grading. DIGEST is a pragmatic, yet robust measure validated in the head and neck cancer population, and adopted into routine practice at MD Anderson Cancer Center with over 13,000 consecutive radiographic modified barium swallow (MBS) studies graded in the clinic using the methodology since development in 2016.

Peer reviewed research shows adoption of DIGEST in external academic medical settings and federally funded clinical trials, but everyday obstacles in real-world practice still limit widespread adoption of this promising tool into routine clinical care. In her FY 2023 R01 funded by the National Cancer Institute, Dr. Hutcheson will address the obstacles, such as scalability to fit diverse clinical contexts, barriers and facilitators of natural dissemination, and conduct and implementation RCT to identify the best method to facilitate adoption and fidelity of use. Using dissemination and implementation science methods, the investigators aim to advance care of dysphagia helping speech-language pathologists improve cancer survivors' outcomes through adoption of DIGEST™. This work will examine the central hypothesis that DIGEST scales-up, maintaining validity in diverse cancer populations under common clinical practice variations with reliable adoption facilitated by an active implementation strategy. The investigators have conducted a STARI-guided implementation evaluation providing the first of its kind data supporting clinical effectiveness of DIGEST in dysphagia assessment, and will expect the R01 results to provide evidence for the validity of DIGEST within diverse oncology populations and across real-world imaging acquisition variations, understand the context and fidelity of natural dissemination of DIGEST in real-world early adopters, and determine the best active implementation strategies to improve reach and fidelity of DIGEST in clinical practice through a multi-site network.

"Collaborating with IGCT has advanced the imaging capabilities of our clinical research program. Through multiple grant applications and projects, IGCT has proposed and overseen imaging processes and analytics that have bolstered our efficiency in toxicity assessment. With the support of IGCT, we have funded an R01 and submitted two P01 applications this year! Looking forward to many productive collaborations with the IGCT."

Katherine A. Hutcheson, Ph.D.
Professor, Head and Neck Surgery

Featured IGCT Investigator-Led Grants in FY 2023



David Ost, M.D.
Professor
Pulmonary Medicine

A Multicenter Study in Bronchoscopy Combining Stimulated Raman Histology with Artificial Intelligence for Rapid Lung Cancer Detection – The ON-SITE Study

NIH/NCI Funded: R44 CA281581

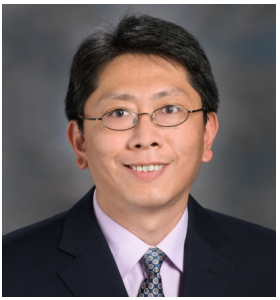
Working to better understand the factors that contribute to pulmonary morbidity and mortality in lung cancer patients in order to develop more cost-effective treatments and interventions is a major driving goal for Dr. David Ost, Professor in Pulmonary Medicine. Dr. Ost, alongside MPIs Christian Freudiger, PhD (Invenio Imaging), Allen C. Burks, MD (UNC Health), and Bryan C. Husta, MD (Memorial Sloan Kettering Cancer Center) are running a multi-center study, the ON-SITE study, to evaluate a medical device, developed by Invenio Imaging, that allows microscopic imaging of fresh, unprocessed tissue biopsies that would provide accurate, near real-time diagnosis based on deep learning techniques to identify bronchoscopic tissue biopsies that are diagnostic of lung cancer. Given that enhanced CT-based screening programs have been widely implemented to detect lung cancer at an earlier stage and the recent advances in robotic bronchoscopy, this work has significant potential to streamline the diagnostic process for lung cancer patients. This medical device utilizes Stimulated Raman Histology, which has previously been shown to be suitable for automated diagnosis in brain tumors via deep learning with a performance that is non-inferior to pathologists.

Future research directions for this collaborative research quartet aim to investigate the potential to provide accurate intraoperative diagnosis of molecular markers that could enable local delivery of pharmaceuticals, ablation, and other therapies during biopsy procedures. Their innovative research was recently funded by an NIH R44 from the National Cancer Institute.

Dr. Ost also collaborates with Dr. Brock and the IGCT research team on a project to develop a robust biomechanical deformable image registration-based model to normalize the complexity of interpatient lung variations to inform diagnostic testing strategy. The optimal diagnostic and staging strategy for lung cancer depends on many factors, and one of the most important ones is location of the nodule within the lung. Location within the lung is a complex construct since it needs to represent location in space relative the pleura as well as location in space relative to the bronchial tree of the lobe it is located in and location relative to other vital structures. The pathway to the nodule is determined by the test type (CT guided biopsy vs. bronchoscopic). For bronchoscopic biopsies, the pathway distance is related to the bronchial tree, with lesions that are further out in the tree being more difficult to target. Lesions further out in the tree also are more likely to have complications, such as pneumothorax. The converse is true for CT guided biopsies. Lesions that are further out in the bronchial tree are sometimes closer to the surface of the body and may be easier to target. Complications for superficial lesions may be somewhat lower, although still higher than with bronchoscopy. Unfortunately, there is tremendous variation between people in terms of their height and the shape of their bodies and lungs. To determine optimal strategy requires a mathematical representation of location that can be applied to all patients despite this variability. The project incorporates imaging data from more than 3,800 lung cancer patients identified by the Context Engine. Tumor characteristics (e.g., location and size) from patients will be mapped into the normalized lung models. Clinical characteristics (e.g., test type, pathologic diagnosis, staging) will also be integrated into the model to enhance predictive capability. The ability of this biomechanical deformable image registration model to predict both diagnostic success and complications will be evaluated in this cohort and then prospectively validated in the future.

Featured IGCT Investigator-Led Grants in FY 2023

Albert Koong, M.D., Ph.D.
Professor and Chair
Radiation Oncology



Boyi Gan, Ph.D.
Professor
Experimental Radiation Oncology

Acquired Resistance to Therapy and Iron (ARTI) Center

NIH/NCI Funded: U54 CA274220

Dr. Albert Koong, Professor and Chair of the Department of Radiation Oncology and Division Head for Radiation Oncology teamed up with Dr. Boyi Gan, Professor in the Department of Experimental Radiation Oncology in FY 2023 for a funded National Cancer Institute U54 grant to establish the Acquired Resistance to Therapy and Iron (ARTI) Center at MD Anderson Cancer Center. The ARTI Center will establish a foundation for understanding the role of iron in cancer resistance to radiation therapy, which can then be extrapolated to other types of cancer therapies. The Center seeks to:

- *Bridge the basic science mechanism of ferroptosis, a novel type of iron-dependent cell death, in acquired resistance to radiation therapy with translational research in preclinical models and human patient samples.*
- *Identify cohorts of patients who are at greatest risk to develop acquired radiation therapy resistance.*
- *Investigate the ability of novel therapeutic agents to re-sensitize cancer cells to radiation by inducing ferroptosis.*

The ARTI Center U54 is comprised of two basic science projects which are mechanistic in nature and one preclinical and translational project, tied together through a Molecular Imaging Core resource. Project 1, led by Dr. Boyi Gan, seeks to determine if ferroptosis evasion is a key driver in acquired radiation therapy resistance using radioresistant lung cancer and esophageal cancer cell lines and xenograft models. Project 2, led by Drs. Albert Koong and Dadi Jiang, will examine if ferroptosis induction during radiotherapy is suppressed by hypoxia, a well-recognized driver of tumor radio resistance, and if hypoxia contributes to radiation therapy-induced acquired resistance to ferroptosis. Project 3, led Dr. Steven Lin, is a preclinical/translational project that will investigate alterations in immune cells within the tumor microenvironment of humanized tumor models derived from chemoradiation therapy-responsive or non-responsive esophageal adenocarcinoma patients. It will also determine if these ferroptosis-mediate immunological changes in the tumor microenvironment can serve as prognostic markers to help clinicians identify tumors that may acquire radiotherapy resistance and thus, could serve as ideal targets for ferroptosis-inducing agents for future preclinical testing. The Molecular Imaging Core is led by Dr. David Piwnica-Worms, and will utilize bioluminescence imaging to monitor tumor growth, PET tracers to identify regions of hypoxia, and redox-tuned PET tracers to identify activated innate immune cells. Long-term outcomes from this Center will foster collaborations and synergy with other centers in the Acquired Resistance to Therapy Network, and ultimately lead to the development of individually tailored cancer treatment therapeutic strategies.

Featured IGCT Investigator-Led Grants in FY 2023

C. Chad Quarles, Ph.D.
Professor
Cancer Systems Imaging

Thomas E. Yankeelov, Ph.D.
Director, Center for Computational Oncology
Oden Institute at The University of Texas at Austin

Imaging-Based Tumor Forecasting to Predict Brain Tumor Progression and Response to Therapy

NIH/NCI Funded: R01 CA260003

Dr. Chad Quarles, Professor at MD Anderson and Dr. Tom Yankeelov, Professor at the Oden Institute at UT Austin, teamed up on a project to develop tumor forecasting methods to predict and optimize patient-specific response of glioblastoma multiforme to standard-of-care therapies. The work seeks to overcome the limitations of standard radiographic methods by providing a tool to more accurately evaluate and predict patient response to treatment. The work will address important gaps for patients battling glioblastoma through the use of advanced, subject-specific imaging data to support the development of predictive, biologically-based mathematical models that incorporate the important characteristics of brain tumor growth such as tumor-induced angiogenesis, hypoxia, necrosis, proliferation, invasion, and resistance to therapeutics. Their innovative proposal was funded in FY 2023 by the National Cancer Institute at the national Institutes of Health (R01CA26003). Congratulations to Dr. Quarles and Dr. Yankeelov on securing funding for this outstanding collaborative project.

CPRIT & NIH Funding Granted to IGCT Investigators in FY 2023

IGCT Investigator	Department	Funding Date	Grant/Role	Grant Title
Manning, H. Charles	Cancer Systems Imaging	04/07/2023	NCI R21 PI	Quantitative imaging of OXPHOS in pancreatic cancer
Piwnica-Worms, David	Cancer Systems Imaging	09/20/2022	NCI U54 Core Lead	Acquired Resistance to Therapy and Iron (ARTI) Center – Molecular Imaging Core
Piwnica-Worms, David	Cancer Systems Imaging	09/01/2022	NCI R01 MPI	[18]4FN PET imaging of innate immunity activation during immunotherapy-induced adverse events
Piwnica-Worms, David	Cancer Systems Imaging	04/02/2023	NCI R21 PI	First-in-human imaging of innate immunity activation with a redox-tuned PET reporter
Quarles, C. Chad	Cancer Systems Imaging	09/19/2022	NCI R01 MPI	Imaging-based tumor forecasting to predict brain tumor progression and response to therapy
Hutcheson, Katherine A.	H&N Surgery	02/15/2023	NCI R01 PI	Dissemination and implementation of DIGEST™ as an evidence-based measurement tool for dysphasia in cancer
Hutcheson, Katherine A.	H&N Surgery	05/01/2023	NCI R01 PI	Hypoglossal neuropathy in the pathogenesis of radiation associated dysphasia (hRAD)
Lai, Stephen Y.	H&N Surgery	09/20/2022	NCI U54 Project Lead	Quantification of cisplatin sensitivity and resistance using metabolic imaging and circulating tumor cell (CTC) biomarkers
Lai, Stephen Y. Bankson, James A	H&N Surgery Imaging Physics	09/01/2022	NCI R01 MPI	Leveraging hyperpolarized MRI for precision oncology approaches in head and neck cancer
Lai, Stephen Y.	H&N Surgery	07/15/2023	NIDCR R01 MPI	Development of miR-27a* for the treatment of head and neck squamous cell carcinoma

CPRIT & NIH Funding Granted to IGCT Investigators in FY 2023

IGCT Investigator	Department	Funding Date	Grant/Role	Grant Title
Lai, Stephen Y. Fuller, C. David	H&N Surgery Radiation Oncology	04/01/2023	NIDCR U01 MPI	Quantitative imaging biomarker prospective validation of dynamic contrast-enhanced MRI as a metric of orodental injury after radiotherapy (QI-ProVe-MRI)
Myers, Jeffrey N.	H&N Surgery	09/22/2022	NCI U54 MPI, Administrative Core Lead	The Houston Center for Acquired Resistance Research (H-CARR)
Bankson, James A	Imaging Physics	09/01/2022	NIBIB R01 Multi-PI	HDO imaging is a quantitative marker of cerebral glucose oxidation
Sokolov, Kostia V. Bankson, James A	Imaging Physics	05/01/2023	NCI R21 MPI	Hyperpolarized 129Xe MRI for imaging NK cell therapy of lung metastasis
Wu, Jia	Imaging Physics	07/01/2023	NCI R01 MPI	Integrated blood and radiomic subtyping to guide immunotherapy treatment selection and early response assessment in metastatic non-small cell lung cancer
Sheth, Rahul A.	Interventional Radiology	09/19/2023	NCI R01 MPI	Novel biomarkers predicting blood clots in ovarian cancer
Sheth, Rahul A.	Interventional Radiology	03/01/2023	NCI R01 PI	An image-guided immunotherapy and hyperthermia delivery device to overcome barriers to tumor immunity for advanced hepatocellular carcinoma
Maitra, Anirban	Pathology	09/14/2022	CPRIT High Impact/High Risk Reward	Identification of enhancers of T-cell anti-tumor activity in PDAC using CRISPR activation screening

CPRIT & NIH Funding Granted to IGCT Investigators in FY 2023

IGCT Investigator	Department	Funding Date	Grant/ Role	Grant Title
Maitra, Anirban	Pathology	09/21/2022	NCI U54 MPI Project Lead Core Lead	Tumor microenvironment crosstalk drives early lesions in pancreatic cancer TBEL Project 2 and Administrative Core
Maitra, Anirban	Pathology	09/16/2023	NCI U24 MPI	PASSCODE (Pancreatic Adenocarcinoma Stromal Reprogramming ConSortium Coordination, Data Management, and education)
Ost, David E.	Pulmonary Medicine	03/01/2023	NCI R44 MPI	A multicenter study in bronchoscopy combining stimulated Raman histology with artificial intelligence for rapid lung cancer detection – the ON-SITE Study
Frank, Steven J.	Radiation Oncology	05/01/2022	NCI R21 PI	Investigating the effect of FLASH-radiotherapy on tumor and normal tissue
Koong, Albert C.	Radiation Oncology	01/01/2023	NCI R01 PI	The Role of HIF2 in Pancreatic Ductal Adenocarcinoma
Koong, Albert C.	Radiation Oncology	09/20/2022	NCI U54 Project Lead	Project 2: Tumor hypoxia promotes acquired resistance to radiation through ferroptosis inhibition
Koong, Albert C.	Radiation Oncology	09/20/2022	NCI U54 MPI	Acquired Resistance to Therapy and Iron (ARTI) Center
Lin, Steven H.	Radiation Oncology	09/20/2022	NCI U54 Project Lead Core Co-Lead	Project 3: Role of genomic and microenvironment factors in conferring acquired resistance to ferroptosis to chemoradiation in esophageal cancer
Sawakuchi, Gabriel O.	Radiation Physics	06/12/2023	NCI R01 PI	Alpha particles combined with ATR inhibition to activate the immune system: mechanisms and pre-clinical translation

*While this list is meant to be inclusive, we acknowledge that we may have missed a grant or two. We kindly request that IGCT investigators please let us know if we've missed any of your recent (FY2023) funding.

Featured Research from IGCT Investigators

Laurence E. Court, Ph.D.
Professor
Radiation Physics

The Radiation Planning Assistant

Expanding low-cost tools to improve the planning and delivery of radiation therapy to cancer patients in low and middle-income countries has long been the driving force behind Dr. Laurence Court's impactful radiation physics research program. His group has developed the Radiation Planning Assistant, a web-based artificial intelligence (AI)-assisted tool that provides automated contouring and treatment planning solutions that was designed specifically for use by radiotherapy providers in low- and middle-income countries with input via collaboration with clinics in these areas. The Radiation Planning Assistant leverages the innovative work in deep learning and artificial intelligence from Dr. Court's laboratory to provide fully automated contouring and radiation planning tools for several tumor and non-tumor specific radiotherapy indications. First, the user uploads a CT scan along with a Service Request form. Next, patient data is deidentified prior to being sent to Dr. Court's Radiation Planning Assistant servers. For simple cases, a radiotherapy plan is automatically generated and sent back to the user and for more complex plans, automatic contouring is performed and is provided back to the user. The user then has ability to review and edit in their own treatment planning system before uploading back to the Radiation Planning Assistant, which will enable generation of the final plan.

Once generated, plans are downloaded back into the user's treatment planning system, where the dose is recalculated and any additional edits are incorporated prior to treating the patient. The Radiation Planning Assistant currently offers contouring and planning for the following:

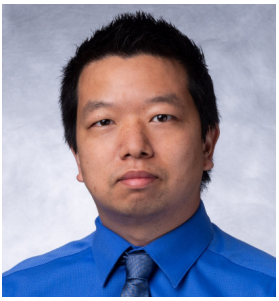
Head & Neck – contouring of normal tissues and elective lymph nodes, VMAT planning (up to 3 dose levels)
Postmastectomy Breast – contouring of chest wall, tangents (with field-in-fields optimization) and supraclavicular fields
Cervix – contouring of CTVs and normal tissues and 4-field box treatments based on CTV contours, 4-field box treatments based on bony landmarks (including beam weight optimization), and VMAT planning
Whole Brain – contouring of brain and normal tissues, opposed laterals treatment of whole brain, with collimator or MLC blocking of normal tissue

The Radiation Planning Assistant represents an important tool to help improve workflows for contouring and radiation therapy planning in low to middle income countries. In partnering with clinics in these regions to provide this tool at low to no cost, Dr. Court and his group are making a huge, potentially life-saving impact in the care of patients around the world. The Radiation Planning Assistant received FDA 510(k) clearance in May 2023 and will launch clinically in 2024, starting in South Africa. Congratulations to Dr. Court and his research team on FDA approval and the clinical launch of the Radiation Planning Assistant in 2024!

"Through access to IGCT Investigators, we can increase and improve the automation tools that we will offer in the Radiation Planning Assistant, thus improving our ability to bring high-quality radiotherapy planning to clinics in low-and middle-income countries."

Laurence E. Court, Ph.D.
Professor, Radiation Physics

Featured Research from IGCT Investigators



Jia Wu, Ph.D.
Assistant Professor
Imaging Physics

Predicting Benefit from Immune Checkpoint Inhibitors in Patients with Non-Small-Cell Lung Cancer by CT-Based Ensemble Deep Learning: A Retrospective Study

Dr. Jia Wu's research group is focused on the development and application of innovative computational and analytical approaches to improve the diagnosis, treatment, early detection, and prevention of cancer. One of the driving themes in his research is to clinically validate imaging biomarkers and embed them into clinical decision systems to guide personalized cancer therapy planning through translational research and precision medicine. For his recent, high impact publication in Lancet Digital Health (IF: 30.8), Dr. Wu partnered with a large team of multidisciplinary collaborators with expertise spanning imaging physics, radiation oncology, medical oncology, radiology, genomic medicine, and pathology at seven institutions nationwide on a retrospective study aiming to predict the benefit from immune checkpoint inhibitors in patients with non-small-cell lung cancer via CT-based ensemble deep learning. The retrospective modeling study examined 976 patients with metastatic, EGFR/ALK negative non-small-cell lung cancer who were treated with immune checkpoint inhibitors.

They developed and validated an ensemble deep learning model based on pre-treatment CT images and clinical factors to predict overall survival and progression-free survival following treatment with immune checkpoint inhibitors. As part of the study, they also evaluated the added predictive value of the model in the context of existing clinicopathological and radiological metrics, and found that AI models outperformed current methods, indicating that the model was able to identify imaging patterns that are predictive, for which the underlying biology is not yet fully understood. Leveraging data from the MD Anderson GEMINI dataset for development and validation, and a cohort from Stanford University as an external validation set, the proof-of-concept study shows that automated profiling of radiographic scans through deep learning methods can provide orthogonal information independent of existing clinicopathological biomarkers. This impactful work and seminal paper by Dr. Wu and collaborators represent one giant step forward in our united goal of enabling precision immunotherapy for patients with non-small cell lung cancer.

“Collaborating with IGCT has significantly enhanced my research capabilities, which leads to several recently secured grants including NIH R01 and CPRIT. Their expertise in image-guided therapy and their commitment to innovation have been instrumental in advancing our projects.”

Jia Wu, Ph.D.
Assistant Professor, Imaging Physics

Featured Research from IGCT Investigators

Eugene Koay, M.D., Ph.D.
Associate Professor, GI
Radiation Oncology

Nab-Paclitaxel, Capecitabine, and Radiation Therapy After Induction Chemotherapy in Treating Patients with Locally Advanced and Borderline Resectable Pancreatic Cancer: Phase I Trial and Imaging-Based Biomarker Validation

The Cancer Physics and Engineering Laboratory at MD Anderson Cancer Center is led by clinician scientist Eugene Koay, MD, PhD and engages in research that aims to improve outcomes for patients with gastrointestinal cancers. The lab focuses biomarkers that may aid early detection strategies for highly lethal cancers in the liver and pancreas as well as support therapeutic approaches that are tailored for each patient. Dr. Koay and his team are specifically focused on discovering novel prognostic and predictive markers through quantitative image analyses, mathematical modeling, and tissue sampling. Their ultimate goal is to develop biomarker-driven early detection strategies and cancer therapeutics that can improve survival rates for these deadly cancers.

Towards this aim, Dr. Koay and a cross-disciplinary team of colleagues from Pathology, Surgical Oncology, Radiation Oncology, Biostatistics, Abdominal Imaging, and GI Medical Oncology departments launched an open-label phase I clinical trial to investigate the safety and tolerability of nab-paclitaxel with concurrent capecitabine-based chemoradiation, after induction of chemotherapy in patients with locally advanced or borderline-resectable pancreatic cancers, and to evaluate a CT-based biomarker of response. The study prospectively evaluated the prognostic value of a CT-based response biomarker that was obtained after induction chemotherapy, but before chemoradiation. Interface response from the CT scans showed prognostic value, indicating that the biomarker may enable better stratification of patients who would benefit from chemoradiation following induction therapy versus those who would be less likely to benefit. The study also established the maximum tolerated dose for nab-paclitaxel in a consolidative chemoradiation therapy regimen for patients with pancreatic ductal adenocarcinoma, and laid the foundation for further evaluation and validation of the imaging biomarker in a phase II clinical trial. Completion of future phases of this study and biomarker validation could help clinicians better select patients for conventional dose chemoradiation in the future.

"Collaborating with IGCT team has tremendously boosted the productivity and scale of our work. We are fortunate to have access to the computational resources, expertise, scientific insight, and knowledge of Dr. Brock and her team. This has been tremendously helpful to our translational and clinical research for liver and pancreatic cancers, especially in terms of using imaging to detect cancer early and to measure treatment responses."

Eugene Koay, M.D., Ph.D.
Associate Professor, GI Radiation Oncology

Featured Research from IGCT Investigators

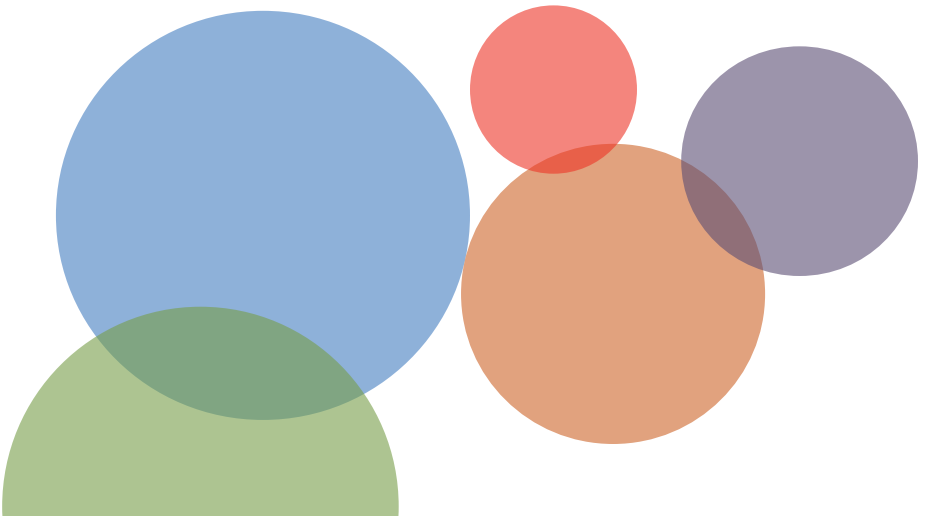
Kostia Sokolov, Ph.D.
Professor
Imaging Physics

Aaron Schwartz-Duval Ph.D.
Postdoctoral Fellow
Imaging Physics

Intratumoral Biosynthesis of Gold Nanoclusters by Pancreatic Cancer to Overcome Delivery Barriers to Radiosensitization

The BOND (Biomedical Optics and Nanodiagnostics) Laboratory at MD Anderson strives to advance nanotechnology, molecular imaging, and biophotonics, leveraging their innovative work in these areas for the early detection, diagnosis, and treatment of cancer. Led by Dr. Konstantin (Kostia) Sokolov, the BOND Lab works to develop platform technologies for applications in molecular imaging and nanotherapeutics. Their work in the latter was recently featured in a peer reviewed publication in ACS Nano, a top nanoscience and nanotechnology journal (IF:17.1). In this study Dr. Aaron Schwartz-Duvall, BOND Lab Postdoctoral Fellow, and his mentor Dr. Sokolov together with collaborators from MD Anderson Cancer Center and UT Health sought to address a major limitation in the use of gold nanoparticles for cancer treatment – their delivery to the tumor. While gold nanoparticles have been shown to significantly enhance photothermal and radiotherapies, delivery of the nanoparticles into solid tumors remains a major barrier towards clinical translation.

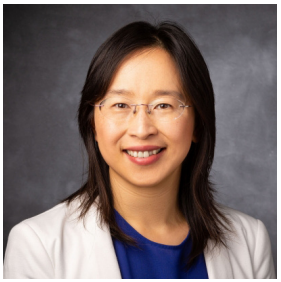
Leveraging previous work in the field of biogeochemistry, Drs. Schwartz-Duval and Sokolov devised a strategy that uses ionic gold, which more readily penetrate tissues, and the tumor cells themselves for intratumoral gold nanoparticle biomineralization. Their comprehensive studies showed tumor-specific biosynthesis of gold nanoparticles from gold ions by cancer cells both in vitro, and in vivo in a murine model of pancreatic cancer. The newly synthesized gold nanoparticles were found to co-localize with the nuclei of tumor cells, and exerted a strong radiosensitization effect that yielded a full suppression of tumor growth lasting at least 40 days in murine tumor models, and a more than two-fold increase of overall survival as compared with radiotherapy alone. Their studies show that using gold biomineralization leverages existing biological pathways to improve the efficacy of radiotherapy, laying the foundation for future translational work. Congratulations to Drs. Sokolov and Schwartz-Duval and their collaborators on this groundbreaking research.



Investigators Joining IGCT in FY 2023

Max Wintermark, M.D., M.S., M.B.A.
Professor and Chair
Department of Neuroradiology

Donna E. Hansel, M.D, Ph.D.
Professor and Division Head
Department of Pathology and Laboratory Medicine



Yinyin Yuan, Ph.D.
Professor
Department of Translational Molecular Pathology
Co-Leader
Focus Area 1, Institute for Data Science in Oncology

Tien Tang, Ph.D.
Research Assistant Professor
Department of Imaging Physics

IGCT Seminars and Workshops

The IGCT holds monthly seminars and quarterly workshops from internal and external speakers that are focused on image guided cancer therapy research and clinical applications. The seminars and workshops are attended by faculty, research staff, and trainees from departments across MD Anderson as well as faculty, staff, and trainees from collaborating institutions. IGCT seminars and workshops are recorded and available on demand to all MD Anderson employees via a link on our IGCT website or upon request. Continuing Medical Education (CME) credits are available to attendees for most IGCT seminars and workshops throughout the year.

FY 2023 IGCT Seminars		
 September 13, 2022	**Tien T. Tang, PhD** - *Postdoctoral Associate*, Dept. of Pediatrics, Baylor College of Medicine	***"Identifying Imaging Features that Predict Radiation Therapy Response in a Preclinical Setting"***
 October 19, 2022	**Jeffrey H. Siewerdsen, PhD** - *Professor*, Depts. of Imaging Physics, Neurosurgery, and Radiation Physics; *Director of the Surgical Data Science Program*, Institute for Data Science (IDSO), MD Anderson Cancer Center	***"Image-Guided, Robot-Assisted Surgery: From High-Precision to High-Reliability"***
 November 18, 2022	**Rebecca M. Howell, PhD** - *Professor*, Dept. of Radiation Physics; *Director,* Medical Physics Graduate Program, MD Anderson Cancer Center	***Radiation-Therapy Related Cardiac Disease in Childhood Cancer Survivors"***

IGCT Seminars and Workshops

FY 2023 IGCT Seminars		
 December 7, 2022	**Jodyn E. Platt, MPH, PhD** *Associate Professor*, Learning Health Sciences, University of Michigan Medical School	***"At the Intersection of AI and Ethics: How do we Engage the Public?"***
 January 25, 2023	**Claudio E. Tatsui, MD** - *Professor*, Dept. of Neurosurgery, MD Anderson *"The Use of LITT for Spinal Metastasis"* **Amol J. Ghia, MD** - *Associate Professor,* Dept. of Radiation Oncology; *Director*, Spine Stereotactic Radiosurgery, Division of Radiation Oncology, MD Anderson *"The Evolving Role of Radiation in Treating Metastatic Epidural Spinal Cord Compression"*	***"Advances in Image Guided Spine Surgery"***
 February 24, 2023	**Thomas G. Purdie, PhD** - *Associate Professor*, Depts. of Radiation Oncology and Medical Biophysics, University of Toronto; *Medical Physicist,* Princess Margaret Cancer Centre, University Health Network	***"Exploring New Treatment Planning Paradigms Using Machine Learning"***
 August 9, 2022	**Jia Wu, PhD** - *Assistant Professor*, Dept. of Imaging Physics, MD Anderson **Tina Cascone, MD, PhD** - *Assistant Professor*, Dept. of Thoracic-Head and Neck Medical Oncology, MD Anderson	***"Habitat Imaging Phenotypes Identify Tumor Molecular Programs and Patterns of Clinical and Circulating Disease Recurrence in Early-Stage Non-Small Cell Lung Cancer"***

FY 2023 IGCT Seminars

 April 13, 2023	**Joseph D. Butner, PhD** - ***Faculty** Fellow*, Mathematics in Medicine Program, Research Institute, Houston Methodist	***"Mathematical Modeling of Biological Systems for Oncology Applications: From Basic Science to Clinically Translatable Methods"***
 May 2, 2023	**Heiko Enderling, PhD** - *Senior Member*, Integrated Mathematical Oncology, Moffitt Cancer Center	***"Data-Driven Predictive Modeling for Personalized Oncology"***
 May 23, 2023	**Marike Gabrielson, PhD** - *Senior Research Specialist*, Dept. of Medical Epidemiology and Biostatistics, Karolinska Institute	***"Molecular Mechanisms of Mammographic Density and Tamoxifen-Induced Density Change – Results from the KARMA Cohort and KARISMA Randomised Clinical Trial"***
 June 5, 2023	**Mirabela Rusu, PhD** - ***Assistant** Professor*, Dept. of Radiology and *Director*, Personalized Integrative Medicine Laboratory, Stanford University	***"From Pathology to Radiology: Bridging the Gap Using Artificial Intelligence"***
 August 11, 2023	***2023 Awardees:*** ***Best Overall Presentation Award -*** Aditya Prasad *(Mentor: Dr. Kristy Brock)* ***Best Design & Graphics Award -*** Riya Patel *(Mentor: Dr. Rahul Sheth)* ***Best Potential for Clinical Impact Award -*** Shirley Pandya *(Mentor: Dr. Tinsu Pan)*	***"IGCT Summer Student Showcase"***

IGCT Seminars & Workshops

FY 2023 IGCT Workshops	
"Navigating Commercialization and Intellectual Property in Image Guided Cancer Therapy Workshop" **December 16, 2022**	**"Creating Valuable Industry Partnerships and Intellectual Property"** ***Emily Barnhill, MHA and Andrew Dennis, PhD*** **"Considerations from a Legal Perspective"** ***Cindy Lee, JD*** **"Conflicts of Interest in Research"** ***Ryan Ingraham, JD, LLM*** **Faculty Panelists:** **David Jaffray, PhD** - Sr. Vice President, Chief Technology & Digital Officer, MD Anderson **Kristy K. Brock, PhD** - Professor of Imaging Physics and IGCT Director, MD Anderson **Eugene J. Koay, MD, PhD** - Associate Professor of GI Radiation Oncology, MD Anderson **Jeffrey H. Siewerdsen, PhD** - Professor of Imaging Physics and Director of the Surgical Data Science Program, MD Anderson **David J. Vining, MD** - Professor of Abdominal Imaging, MD Anderson and Founder and CEO of VisionSR
"GitHub Workshop" ***January 27, 2023***	**Presenters:** **John Wood, MS -** *Senior Applications Systems Analyst*, Dept. of Enterprise Development and Integration, MD Anderson **Austin Castelo, BS - Associate Applications Systems Analyst, Dept. of Imaging Physics, MD Anderson** **Part I: GitHub Basics** *-for faculty, investigators, future, and active GitHub Users (15 min)* **Part II: Using Institutional GitHub** *– for active and future GitHub users (45 min)* **Part III: GitHub Demo, Interactive Discussion, and Troubleshooting** *– for active and future GitHub users (1hr)*
"Human Brain Finite Element Mesh Generation from Patient MRI Data" ***March 6, 2023***	**Travis Thompson, PhD -** *Assistant Professor*, Dept. of Mathematics and Statistics, Texas Tech University **Part I: Motivation and an Introduction to the Software Pipeline** *(30 min, online and in person)* **Part II: Building Your First Finite Element Human Brain Mesh with the SVMTk** *(90 min, online and in person)* **Part III: Hands-On Mesh Generation Open Lab** *(90 min, in person only - No online option)*

FY 2023 IGCT Workshops

"IGCT Workshop on Grant Writing (K-Award Focus)" **April 25, 2023**	**Facilitator: C. Dave Fuller, MD, PhD -** *Professor*, Dept. of Radiation Oncology, MD Anderson **Faculty Panelists:** **Amy C. Moreno, MD** - *Assistant Professor*, Dept. of Radiation Oncology, MD Anderson (K01 & K12 Recipient) **Ajay Sheshadri, MD** - *Associate Professor*, Dept. of Pulmonary Medicine, MD Anderson (K23 Recipient) **Leomar Y. Ballester, MD, PhD** - *Assistant Professor*, Dept. of Pathology, MD Anderson (K08 Recipient) **Brian A. Taylor, PhD** - *Associate Professor*, Dept. of Imaging Physics, MD Anderson (K23 Recipient) **Stephen Y. Lai, MD, PhD** - *Professor*, Dept. of Head & Neck Surgery, MD Anderson (K08 Recipient)
"Innovations in MR-Linac Treatment – Physics Perspective" ***July 22, 2023***	**Facilitator and Moderator:** **Dr. Jinzhong Yang -** *Assistant Professor*, Dept. of Radiation Physics, MD Anderson Cancer Center **Speakers:** *"Strategies for Alternative Online Adaptation Workflows"* **Eric Paulson, Ph.D.** - *Associate Professor*, Dept. of Radiation Oncology, Medical College of Wisconsin *"Treatment Planning Insights"* **Daniel Hyer, Ph.D.** - *Professor*, Dept. of Radiation Oncology, University of Iowa *"Implementation of Customized Imaging Sequences for MR-Guided Adaptive Radiotherapy in High-Field MR-Linac"* **Ergys Subashi, Ph.D.** - MD Anderson Cancer Center (formerly of Memorial Sloan Kettering Cancer Center) *"Online Adaptation Workflows QA"* **Weiguo Lu, Ph.D.** - *Professor*, Dept. of Radiation Oncology, UT Southwestern *"MR-Linac Motion Management: Start of a New Dawn"* **Martin Fast, Ph.D.** - *Associate Professor*, Dept. of Radiotherapy, University Medical Center Utrecht
"Pre-Registration, Pre-Prints, Public Access, and FAIR & Open Science: Transparency and Equity in Data-Driven Science" ***August 24, 2023***	**Facilitator:** **C. Dave Fuller, MD, PhD -** *Professor*, Dept. of Radiation Oncology, MD Anderson

IGCT Initiatives

In addition to our existing seminar and workshop series, the IGCT launched selected new initiatives in FY2023 to help further our goal to provide mentorship in developing research programs and writing grants and to support and engage in impactful multidisciplinary research.

Breast Imaging Department and IGCT Program Pilot Grants

IGCT partnered with Wei Yang, MD, Professor and Chair of the Department of Breast Imaging to strengthen research collaboration through a call for research pilot grants for faculty in the Department of Breast Imaging. The single page research proposals were scored by a panel via NIH scoring approach for overall impact, significance, investigator, innovation, approach, and environment. The pilot included two awardees in its inaugural year; each were paired with an IGCT Investigator for mentoring in grant proposal development and matched based on required technical skills with an IGCT research staff or postdoctoral fellow with dedicated effort to the investigator's project. The pilot was graciously funded by Dr. Yang and the Department of Breast Imaging.

2023 Breast Imaging Department and IGCT Program Pilot Grant Awardees:

Olena Weaver, M.D.
Associate Professor
Department of Breast Imaging

"Creating and Clinically Validating an AI-Based Breast Cancer Early Detection Algorithm That Utilizes Dynamic Evaluation of Mammographic Imaging Features in a Mammography Screening Cohort"

**Awarded seed funding grant in October 2023 from the Joint Center for Computational Oncology for her proposal "Development of a processing pipeline for automated longitudinal mammography analysis in a large prospective breast cancer screening cohort" with collaborator Edward Castillo, PhD (Oden Institute, UT Austin)*

Miral Patel, M.D.
Associate Professor
Department of Breast Imaging

"Comparison of Adjunct Screening Utilizing Magnetic Resonance Imaging, Molecular Breast Imaging, and/or Contrast Enhanced Mammography in Patients with a History of Breast Cancer"

IGCT Initiatives

DI-STEP Summer Undergraduate Research Program

In line with our mentorship goal and working towards addressing the disproportionate lack of underrepresented students in STEM fields, medical physics, and radiology, Kristy Brock, Ph.D. (Imaging Physics, Megan Kalambo, M.D. (Breast Imaging), Toma Omofoye, M.D. (Breast Imaging), and Bruno Odisio, M.D. (Interventional Radiology) were awarded a competitive internal pilot grant from the MD Anderson Summer Experience that provided funding for the Diagnostic Imaging – Summer Training & Experiences Program (DI-STEP). The DI-STEP Program welcomed five undergraduate trainees from Texas Southern University from June 5th through August 11th, 2023 for full time (40hr/week), program-paid internships. The strategically designed pathway program featured:

- *Exploration of diagnostic imaging and radiology clinical careers through "A Day in the Life" clinical rotations with physician mentors each week (4hr/week)*
- *Hands on, immersive research project in imaging physics, artificial intelligence, machine learning, and radiology (32hr/week)*
- *Career development, professional development, and career exploration workshops and related activities*
- *Personalized mentoring and career advising with program staff, Directors, and MD Anderson faculty*
- *Dedicated program and institutional activities to broaden their knowledge of and exposure to careers in cancer research and medicine*

Originally piloted with two students during the summer of 2022, the DI-STEP Program expanded, with funding, in 2023. All trainees completed research projects and presented their work as a podium presentation at the IGCT Summer Student Showcase, and as a poster at the MD Anderson Summer Experience Symposium. Trainees from the 2022 cohort have both graduated with bachelor's degree in biology and physics, and are both employed full-time in research at Rice University and MD Anderson Cancer Center, respectively.

2023 DI-STEP Summer Undergraduate Trainees meet with Dr. Cherilynn Shadding, Associate Dean of Graduate Education for the MD Anderson UTHealth Houston Graduate School of Biomedical Sciences for a professional development workshop. Photo taken Summer 2023.

IGCT Initiatives

DI-STEP Summer Undergraduate Research Program

Olubunmi Lebimoyo, B.S. 2022

Project: *Dose Accumulation with CBCT Conversion for Head and Neck Cancer and Prostate Cancer*

Mentor: Kristy Brock, Ph.D.

Stephanie Robles, B.S. 2022

Project: *Dose Accumulation with CBCT Conversion for Head and Neck Cancer and Prostate Cancer*

Mentor: Kristy Brock, Ph.D.

Brionna McZeal, 2023

Project: *Using Magnetic Resonance Spectroscopy to Determine Brain Health in Smokers*

Mentor: Brian Taylor, Ph.D.

Jalen Jackson, 2023

Project: *Early Detection, Localization, and Resection of Pancreatic Tumor Employing Image Guided Surgery (IGS)*

Mentor: Charles Manning, Ph.D.

Faith Shakoor, 2023

Project: *Imaging Techniques to Analyze Arterial Anatomy in a Pig Model*

Mentor: Erik Cressman, M.D., Ph.D.

TaMiyah Gramling, 2023

Project: *A Comparative Study: Proton vs. Photon Radiation Therapy for Non-Small Cell Lung Cancer*

Mentor: Kristy Brock, Ph.D.

Sanaa McNeil, 2023

Project: *Colorectal Cancer: Association Between Changes in ctDNA and Post-Ablation Metastases*

Mentor: Bruno Odisio, M.D.

Image Guided Cancer Therapy T32 Training Program

MPIs/Program Directors:
- Kristy K. Brock, Ph.D. (Imaging Physics)
- Stephen Lai, M.D., Ph.D. (Head and Neck Surgery)
- C. Dave Fuller, M.D., Ph.D. (Radiation Oncology)

The **IGCT T32 Training Program** provides integrated, cross-disciplinary research and training needed for tomorrow's pioneering researchers to advance image guided cancer therapy (surgery, interventional and diagnostic radiology, radiation oncology, and correlative pathology).

Program Overview

- Cross-disciplinary & mentoring and support from established clinician scientists and investigators
- Personalized and adaptable training plan to fit your career goals
- Immersive multi-disciplinary research
- Clinical shadowing with IGCT faculty in key image guided cancer therapy areas
- Scientific & grant writing training with faculty guidance and mentoring to help the trainee achieve independent funding (e.g., NIH K-awards)
- Professional development and knowledge building writing development opportunities:
    - IGCT courses
    - Seminar series
    - Journal club
    - Clinical trials & clinical research training

Eligibility

- Ph.D., M.D., or M.D./Ph.D. (or equivalent; within 3 years of degree or completion of clinical residency program)
- Strong desire and interest to pursue research in image guided cancer therapies
- US citizen or permanent resident (NIH requirement)

How to Apply

Interested candidates may submit an application to include the below documents via the link provided below:

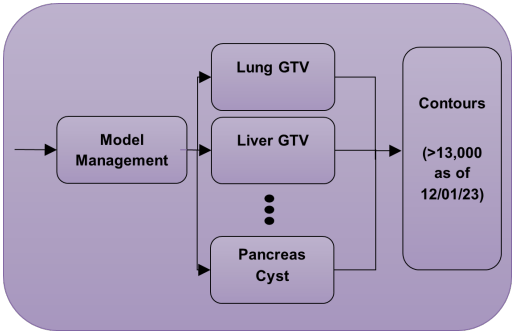
- CV
- Research/Interest statement
- Adversity/Diversity statement
- Contact information for three referees to provide letters of reference

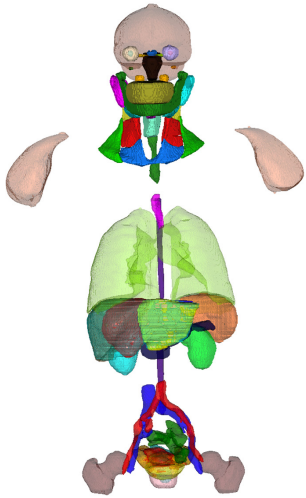
To learn more or apply for the program,
visit http://www.mdanderson.org/IGCT-T32
or email us at IGCT-T32@mdanderson.org.

Stay tuned for additional didactic and interactive learning opportunities from the IGCT T32 Program that will be opened to MD Anderson trainees in FY24. These include a short course on imaging to provide foundational knowledge on imaging modalities, and an IGCT T32 Seminar course, which is designed to teach critical, multi-disciplinary problem-solving skills in the field of image guided cancer therapy. The latter will be divided into blocks, each focused on a different anatomical site. Physicians will pose their clinical challenges in session 1, followed by technical experts presenting on recent innovations and advances in their fields in session 2. Seminar participants will then have two sessions to identify a problem and work together to propose grant-like aims to address the clinical challenge(s), and will present their proposed solutions in session 5 to clinicians, technical experts, and T32 leadership. If you are a postdoctoral fellow at MD Anderson and are interested in participating, please contact IGCT-T32@mdanderson.org for additional information.

Artificial Intelligence-Based Autosegmentation Tools

As accuracy in artificial intelligence-based autosegmentation tools continues to rise, their utility in clinical and research applications will broaden. Several highly productive groups at MD Anderson Cancer Center are working in this space, and have developed accurate, reliable, and robust autosegmentation models that can be leveraged via collaboration for research and (for select approved models) for clinical deployment. Contributing labs include: Jinzhong Yang, PhD (Radiation Physics, Yang A2RT Lab), Laurence Court, PhD (Radiation Physics, Court Lab and Radiation Planning Assistant), Kristy Brock, PhD (Imaging Physics, Morfeus Lab), and Tumor Measurement Initiative (a Strategic Research Initiative Development program) investigators including Caroline Chung, MD, David Fuentes, PhD, and Tucker Netherton, PhD. If you are interested in utilizing one of these models for your work, please contact the respective faculty.





Morfeus Lab/IGCT (Kristy Brock, Ph.D.)

- Liver & Liver GTV
- Liver Segments
- Brain Fold
- Brain Ventricles
- Pancreas & Cyst
- Duodenum
- Lung & Lung GTV
- Female Pelvis
  - cervix-uterus
  - vagina
  - parametrium
  - bladder
  - rectum
  - sigmoid
  - femoral heads
  - kidneys
  - spinal cord
  - bowel in a bag
- Male Pelvis
  - bladder
  - rectum
  - iliac veins & arteries
  - femoral heads

Yang A^{2}RT Lab (Jinzhong Yang, Ph.D.)

- Heart
- Heart Chambers
  - atrium L/R
  - ventricle L/R
- Great Vessels
  - aorta Asc/Dsc
  - pulmonary A/V
  - vena cava S/I
- Heart Valves
  - aortic
  - pulmonary
  - mitral
  - tricuspid
- Coronary Arteries
  - LAD
  - LMCA
  - LCX
  - RCA

Computational Research Lab (David Fuentes, Ph.D.)

- Brain
  - Skull
  - Glioma
  - GTV
- Liver
  - Whole liver
  - Tumor (HCC)

Fuller Laboratory
(C. Dave Fuller, M.D. Ph.D.)

- Swallowing-Related
  - Cartlg_thyroid
  - Cricoid
  - Crico-pharyngeus
  - Glottic_area
  - Musc_buccinat (L&R)
  - Musc_constrict (i, m, & s)
  - Musc_digastric a (L&R)
  - Musc_digastric p (L&R)
  - Musc_ genioglossi
  - Musc_masseter (L&R)
  - Musc_ mghcomplex
  - Pterygoid_lat (L&R)
  - Pterygoid_med (L&R)
  - Larynx_sg
  - Tongue

Chung Laboratory
(Caroline Chung, M.D.)

- Brain Metastasis GTV
- Brain Organs-At-Risk:
  - Brainstem
  - Eye_R
  - Eye_L
  - Lens_R
  - Lens_L
  - OpticNrv_R
  - OpticNrv_L
  - Optic Chiasm
  - Cochlea_R
  - Cochlea_L
  - Pituitary gland
  - Hippocampus_R
  - Hippocampus_L

Tumor Measurement Initiatives
(Other Models)

- Brain glioma GTV & lymph nodes
- Whole lung
- NSCLC lesions
- Neuro-oncology pipeline (includes skull-stripping)

Court Lab/Radiation Planning Assistant (Laurence Court, Ph.D.) & Netherton Lab (Tucker Netherton, Ph.D.)

- GI/Rectal/Gyn
  - Duodenum
  - Small_Bowel
  - Large_Bowel
  - Liver
  - Spleen
  - Kidney (L&R)
  - Bone Marrow
  - Bladder
  - Bowel Bag
  - Abdominal Wall
  - CTVp
  - CTVn
  - PAN CTV
- Thoracic
  - Subheart_LV
    Heart
    Esophagus
  - Brachial Plexus (L&R)
    Carina
  - Trachea
    Liver
  - Lung (L&R)
- Bone
  - Vertebral_Column
  - Sacrum
  - Pelvic bone
    Femur (L&R)
  - Vertebrae (C1-7)
  - Vertebrae (T1-12)
  - Vertebrae (L1-5)
  - Humerus_AC
  - Femur Head (L&R)
- Neck Lymph Nodes
  - LN_Neck_IA (L&R)
  - LN_Neck_IB (L&R)
  - LN_Neck_II (L&R)
  - LN_Neck_III (L&R)
  - LN_Neck_IV (L&R)
  - LN_Neck_RP (L&R)
  - LN_Neck_V (L&R)
  - LN_Neck_VIA
  - LN_Neck_VIB
  - LN_Neck_VIIA (L&R)
  - LN_Neck_VIIB (L&R)
  - LN_Neck_VIII (L&R)
  - LN_Neck_IX (L&R)
  - LN_Neck_XA (L&R)
  - LN_Neck_XB (L&R)
- Breast
  - Breast CTV
  - Lymph Node Axilla I, II, & III
  - Lymph Node Sclav
  - Lymph Node IMN
  - Lymph Node Level II Aggressive Extend
  - SCV_IMN Connector
  - Contralateral Breast
  - Lymph Node SCLAV Posterior
  - SkinFold_Avoid
  - Wires & Expanders
- Head & Neck
  - Nasopharynx
  - Pterygoid_Fossae
  - Maxillary_Sinus
  - Sphenoid_Sinus
  - Clivus
  - Cricoid
  - Orbit (L&R)
  - Mastoid (L&R)
  - Brain
  - Brain Stem
  - Spinal Cord
  - Chochlea (L&R)
  - Esophagus
  - Eye (L&R)
  - Lens (L&R)
  - Chiasm
  - Optic Nerve (L&R)
  - Parotid (L&R)
  - Sub-mandibular Gland (L&R)
  - Mandible

Our IGCT Technical Staff is Growing

Stephanie Robles, B.S. joined the IGCT in Summer 2023 as Research Assistant I. Stephanie is a graduate of Texas Southern University with a Bachelor's in Science degree in Physics with a pre-medical concentration. She previously worked with the IGCT as a summer undergraduate student during her senior year of undergraduate studies. Stephanie's research in the IGCT includes manual segmentation of pelvic organs for dose accumulation, development of AI segmentation models, image registration and analysis, and curation of clinical data.

Mark S. Hickey, Ph.D. joined the IGCT in Summer 2023 as a Data Scientist. He received his Ph.D. in Geophysics from Texas A&M University. Dr. Hickey's primary focus in the IGCT is on applying finite element methods to biomechanical modeling of soft tissue deformation. His current projects include modeling the deformation of the brain during neurosurgery, and the development of tools for FEM-based modeling for applications in the brain and pancreas.

Caleb O'Connor, M.S. joined the IGCT as a Physics Assistant in Summer 2021. Caleb earned his B.S. and M.S. in Physics from the University of Louisiana at Lafayette. He was promoted to Data Scientist in Spring 2023. In his current role in IGCT, Caleb works on scripting automation of existing algorithms for clinical research and deployment, building pipelines, image analysis and registration, and in many additional computational areas.

Austin Castelo, B.S. joined the IGCT in Spring 2022 as an Associate Systems Analyst. Austin is a graduate from the University of California, Santa Barbara, where he earned a B.S. in Financial Mathematics and Statistics. Austin brings significant strengths in computational sciences, AI model development, computer vision/image analysis, application container development, and statistics. IGCT-related projects Austin contributes to include AI model development for segmentation of the liver for the COVERALL trial, deformable image registration of the brain during neurosurgery, and streamlining data sharing efforts as part of a core for a P01.

Mais Al Taie, M.D., Ph.D. joined IGCT as a Research Investigator in the Spring of 2022. Dr. Al Taie received her Ph.D. in Radiology and Oncology from Tokyo Medical and Dental University and her M.D. from the University of Mustansiryah in Iraq. Dr. Al Taie's projects include manual and AI algorithm-based contouring and assessment of liver images towards developing robust AI segmentation algorithms and vessel annotation detection on CT and ultrasound images toward the development of a deep learning model for vessel identification.

Nihil Patel, M.S. joined the IGCT as a Research Assistant II in October 2022. Nihil is a graduate from the University of Houston, where he earned an M.S. in Computer Science. Prior to joining the IGCT, Nihil served as a research intern at Baylor College of Medicine and at Gottingen University. Nihil's primary project is to retrain the Morfeus Lab's deep learning CT segmentation algorithms on newer data with the eventual goal of evaluating their performance on MR images via transfer learning. Nihil brings coding, scripting, AI algorithm development, and computational sciences skills to his work in the IGCT Program.

Kari Brewer Savannah, Ph.D. joined the IGCT in Fall 2020 and serves as the Program Director. Dr. Savannah holds a BS in Chemistry from Hillsdale College and a PhD in Biochemistry and Biomedical Sciences from the MD Anderson UTHealth GSBS. She previously served as Assistant Professor at the University of Texas at Brownsville and Houston Baptist University. Dr. Savannah has significant experience in the design, management, and assessment of research training programs, educational programming, and in initiatives to expand diversity, equity, and inclusion for underrepresented minorities in STEM fields. Dr. Savannah brings a strong background in research administration, scientific project management, and program management to her role in the IGCT. Dr. Savannah manages large, multidisciplinary scientific projects, assists in multi-investigator grant preparation and management, and manages IGCT classified staff.

How Can the IGCT Help You as an IGCT Investigator?

Have a small project or piece of a grant that requires a computational scientist, scripting, or other tasks but can't justify hiring a full FTE? Tap in to IGCT resources to fill these needs!

Please contact the IGCT Program (IGCTR@mdanderson.org) or reach out to IGCT Director Dr. Kristy Brock to learn more about IGCT-based resources or discuss options and resource availability.

- ○ Medical image annotation and contouring
- ○ Image analysis
- ○ Image registration
- ○ Anatomical modeling
- ○ Finite element models and analysis
- ○ Coding and scripting
- ○ AI algorithm development
- ○ Scaling code/building pipelines
- ○ Application container development
- ○ Computational science needs

To learn more about the Image Guided Cancer Therapy Program at MD Anderson Cancer Center, please visit our website at www.mdanderson.org/IGCT or email us at igctr@mdanderson.org.

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