

Emory Radiology and Research

The Department of Radiology and Imaging Sciences is known worldwide for its strong leadership in quantitative, personalized precision medicine. Emory Radiology's collaborative and multidisciplinary research teams engage both internationally renowned experts and promising junior researchers in advancing innovative lines of inquiry that are integrated with our clinical practice and teaching programs. The division is especially committed to mentoring junior faculty and interested residents toward successful research careers.

SIX PRIORITY AREAS OF DISCOVERY

Advanced Imaging: Researchers are leveraging expertise in MR, PET, and CT and advanced imaging technologies like MR spectroscopy, photon-counting CT, single-photon emission CT (SPECT), and more to develop new imaging methods and applying these methods to improve the diagnosis, treatment, and understanding of various diseases. Focus areas include neuroimaging, cardiovascular imaging, and body imaging.

Computational Image Analysis & Guidance: The team specifically focuses on 1) translating basic science to clinical trials involving stem cell biology, drug-delivery, ablative therapies, and medical device development; 2) developing novel guidance modalities and procedure related imaging systems; and 3) validating novel applications for advanced image-guided techniques developed by its team of basic scientists and clinical investigators. The team envisions radiologic imaging in the future as transcending diagnosis and more precisely guiding treatment of disease.

Imaging Implementation Sciences: Faculty are international leaders in medical image perception research and human factors assessment. They are 1) employing advanced eye-tracking and related technologies to improve imaging interpretation; 2) assessing the impact of the increased amount and diverse nature of information accompanying images on the diagnostic process; 3) improving methods used to train future radiologists; and 4) utilizing human factors methods to optimize the reading environment. Team members also are pioneers of policy-focused imaging health services research and publish widely on imaging utilization, payment systems, disparities, and outcomes.

Imaging Informatics: This team of physicians, physicists, clinical informaticists, and researchers offers innovative technological solutions to bridge gaps among researchers, administrators, and information technology professionals, thereby advancing the research mission of Emory Radiology. Team members also pursue research and development in quality, patient safety, image processing, natural language processing, the value chain, and patient engagement.

Molecular Imaging, Biomarker & Probe Development: This team excels in cutting-edge, innovative, and scholarly scientific research on the design, synthesis, characterization, evaluation, and validation of MR, PET, SPECT, and optical imaging probes and technologies to fill unmet needs in healthcare and precision medicine. The interdisciplinary team's goals are (1) to perform the highest quality scientific research in biomarker discovery and biomarker-targeted imaging for oncology, cardiology, psychiatry, neurology, and infectious diseases; (2) to translate new imaging probes from bench-to-bedside for the biomarker-specific diagnosis and individualized management of diseases; and (3) to develop the next generation of biomarker and imaging probe scientists and young faculty. We serve Emory University as well as the national and international scientific communities with a rich environment and world-class research expertise.

Precision Imaging: Quantitative, Molecular & Image-guided Technologies: The team is focused on 1) quantitative imaging, 2) novel molecular & imaging technologies, 3) image-guided interventions, and 4) big data and radiomics. The overarching goal is to use advanced imaging technology and engineering tools to help our researchers and clinicians detect diseases at an earlier stage, deliver more precise and targeted therapy, and monitor treatment response at the cellular and molecular

levels. The team incorporates new imaging and biomedical technologies into both investigative and translational research approaches directed to precision medicine.

RESEARCH SUPPORT SERVICES

The Physics Service Group comprises clinical and research scientists with technical expertise and training in computed tomography, radiation oncology, nuclear medicine, ultrasound, and magnetic resonance imaging. The group provides technical oversight for all modality quality-control issues in order to maintain efficient and effective clinical operations. The group conducts and supports modality research and quality improvement projects in collaboration with clinical and research faculty across the School of Medicine.

The Center for Systems Imaging (CSI) offers MR, PET, and microPET/CT imaging; radio-pharmacy services; and data analysis for animal and human imaging studies by Emory researchers. CSI has unique capacity for pediatric imaging to support pediatric clinical research. CSI also supports the development and application of imaging biomarkers and hosts educational programs.

RESEARCH PARTNERSHIPS

Research efforts are multidisciplinary: research teams include internationally renowned experts from other medical specialties, other academic disciplines, and other institutions.

Through the **Winship Cancer Institute**, a National Cancer Institute-Designated Comprehensive Cancer Center, Emory Radiology faculty collaborate with Emory colleagues in biomedical informatics, biostatistics, and computer science, plus clinical researchers in cardiology, neurology, pathology, psychiatry, urology, psychology, and neuroscience, among others, on translational cancer research.

The **Georgia Clinical & Translational Science Alliance** (Georgia CTSA) is an interinstitutional magnet that concentrates basic, translational, and clinical research investigators, community clinicians, professional societies, and industry collaborators in dynamic clinical and translational research projects. Emory engaged Morehouse School of Medicine, Georgia Institute of Technology, and the University of Georgia in forming the Georgia CTSA to achieve compelling, unique, and synergistic advantages for research and patients statewide.

Wallace H. Coulter Department of Biomedical Engineering at Emory and Georgia Tech, which incubates novel biomedical research across technical area groups including biomedical imaging and optics. Emory Radiology faculty have opportunities to teach courses and engage biomedical engineering students in their research labs.