

# BIOMEDICAL IMAGING

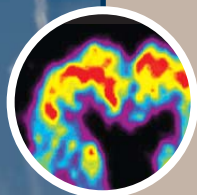
## *...Imaging at the Molecular, Cellular, and Organ Levels*

The rapidly growing field of biomedical imaging enables one to visualize physiological structures, measure biological functions, and evaluate cellular and molecular events without requiring invasive procedures. Opportunities in imaging span all of the major, and emerging, modalities, including magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission coherence tomography (SPECT); ultrasound imaging; optical coherence tomography (OCT); computed (x-ray) tomography; bioluminescence imaging; fluorescence imaging; and other optical imaging methods including novel technologies like cryo-imaging.

The Department of Biomedical Engineering at Case Western Reserve University is a recognized leader in biomedical imaging research, and our research program serves as a cornerstone for a number of interdisciplinary programs, including cancer detection, gene therapy, nanotechnology, drug delivery and understanding of metabolic diseases like diabetes.

Our research program aims to define medical imaging technology and applications that will be used both in the laboratory and in the clinical setting now and in the coming decade. By providing a program with strength in instrumentation and devices, computational algorithms, new imaging compounds, and novel clinical applications, we are confident that our program will continue to lead imaging innovation. Applicable skills include: chemistry, numerical methods and programming, electronics, physics, optics, biomedical engineering, digital systems, physiology, biology, and/or design.

To achieve this mission, our imaging research includes, but is not limited to: developing new imaging modalities that provide unprecedented spatial resolution in the clinical setting; new computer algorithms and hardware that will lead to improvements in image quality, exceeding those over the past two decades; and using genetic information to develop new chemical compounds that reveal tumor margins or become active only in the presence of unique biological markers.



Department of Biomedical Engineering



### Primary Faculty

#### **JAMES P. BASILION, Ph.D.**

Joint Associate Professor of Biomedical Engineering and Radiology

*Ph.D. in Biomedical Sciences, Molecular Pharmacology, University Health Science Center at Houston, 1990*

High resolution imaging of endogenous gene expression; definition of molecular signatures for imaging and treatment of cancer and other diseases; generation and utilization of genomic data to define informative targets; strategies for applying non-invasive imaging to drug development; novel molecular imaging probes and paradigms

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#### **JEFFREY L. DUERK, Ph.D.**

Chairman and Allen H. and Constance C. Ford Professor

*Ph.D. in Biomedical Engineering, Case Western Reserve University, 1988*

Magnetic resonance imaging; rapid magnetic resonance imaging pulse sequence development; image reconstruction from non-rectilinearly sampled data; the development of image-guided interventional MRI procedures, including percutaneous cancer and cardiovascular procedures

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#### **ANDREW M. ROLLINS, Ph.D.**

Warren E. Rupp Associate Professor of Science and Engineering

*Ph.D. in Biomedical Engineering, Case Western Reserve University, 2000*

Biomedical diagnosis; novel optical methods for high-resolution; minimally invasive imaging; tissue characterization and analyte sensing; real-time microstructural and functional imaging using coherence tomograph

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#### **DAVID L. WILSON, Ph.D.**

Robert Herbold Professor of Biomedical Engineering and Radiology

*Ph.D. in Electrical Engineering, Rice University, 1985*

Medical image processing; image segmentation, registration, and analysis; quantitative

image quality of X-ray fluoroscopy and fast MRI; interventional MRI treatment of cancer  
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#### **XIN YU, Ph.D.**

Associate Professor

*Sc.D. in Radiological Sciences, Massachusetts Institute of Technology, 1996*

Cardiovascular physiology; magnetic resonance imaging and spectroscopy; characterization of the structure-function and energy-function relationships in normal and diseased hearts; small animal imaging and spectroscopy

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### Research Faculty

#### **ANN-MARIE BROOME, Ph.D.**

Research Assistant Professor

Molecular imaging of complex signatures in cancer; in vivo and in vitro imaging of cellular mechanisms in differentiation, inflammation, and carcinogenesis; and signaling of chemotactic peptides in epithelia

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#### **ZHILIN HU, Ph.D.**

Research Assistant Professor

Applied optics, including optical remote sensing biomedical imaging and laser spectroscopy; optical instrumentation, including theoretical modeling to system and components design for applications in clinical gastrointestinal endoscopies, pulmonary studies, skin and cardiac diseases, and disease prevention

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### Associated Faculty

#### **AGATA EXNER, Ph.D.**

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Innovative applications of biocompatible polymers and other biomaterials in imaging and interventional radiology

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**ELIZABETH FISHER, Ph.D.**

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Quantitative image analysis for monitoring multiple sclerosis  
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**CHRISTOPHER FLASK, Ph.D.**

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MR imaging; spectroscopy acquisition; reconstruction algorithms to assess molecular mechanisms of cancer and diabetes  
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Associate Professor in Radiology  
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**ZHENGHONG LEE, Ph.D.**

Associate Professor of Radiology  
Quantitative PET and SPECT imaging; multimodal image registration; 3-D visualization; molecular imaging; small animal imaging  
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**RAYMOND MUZIC JR., Ph.D.**

Associate Professor of Radiology  
Develop and apply methods for quantitative physiological interpretation of image data  
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**MARK S. RZESZOTARSKI, Ph.D.**

Professor  
Computer applications in radiology, including magnetic resonance imaging, computed tomography, nuclear medicine, and ultrasound  
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**JAMES D. THOMAS, M.D.**

Moore Chair of Cardiovascular Imaging, Heart and Vascular Institute, Cleveland Clinic  
Cardiac imaging, image processing, echocardiography, MRI, and cardiac CT imaging; cardiac mechanics and valvular dysfunction; structural and fluid dynamics modeling of the cardiovascular system cardiac alterations and telemedicine in manned space flight  
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**JEAN TKACH, Ph.D.**

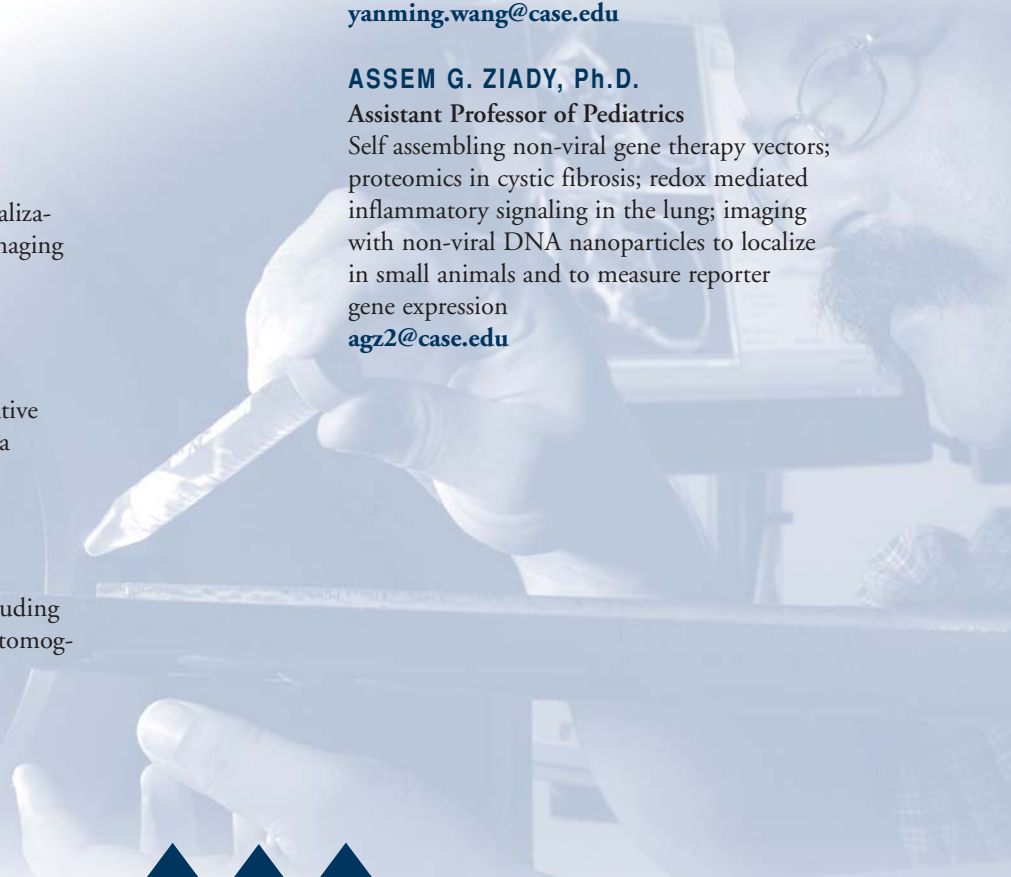
Assistant Professor of Radiology  
Neuro MRI imaging in human and animals; emphasis in functional, diffusion and perfusion MR imaging techniques and applications  
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**YANMING WANG, Ph.D.**

Associate Professor of Radiology and Chemistry  
Develop molecular probes and conduct in vivo preclinical and clinical imaging studies in neurology, oncology, and cardiology  
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**ASSEM G. ZIADY, Ph.D.**

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Self assembling non-viral gene therapy vectors; proteomics in cystic fibrosis; redox mediated inflammatory signaling in the lung; imaging with non-viral DNA nanoparticles to localize in small animals and to measure reporter gene expression  
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# LABS & CENTERS

## AFFILIATED LABS AND CENTERS

- BioMedical Imaging Laboratory (<http://bme.case.edu/bmil>)
- Biophotonics Imaging Laboratory (<http://oct.case.edu>)
- Cardiovascular Research and Imaging Laboratory (<http://bme.case.edu/yu>)
- Case Center for Imaging Research (<http://ccir.uhrad.com>)
- Neurological Surgery Imaging Laboratory (<http://casemed.case.edu/Neurosurgery/ImagingLab>)

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