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### GREGG E TRAHEY, PROFESSOR AND FACULTY

Dr. Trahey's research interests include medical ultrasound, image guided surgery, adaptive imaging, imaging of tissue's mechanical properties, and radiation force imaging.



Research in Dr. Trahey's laboratory focuses on experimental investigations of advanced ultrasonic imaging methods with a focus on cardiac and liver imaging. The laboratory's experimental capabilities are centered around several state-of-the-art clinical phased array scanners in facilities in the Pratt School of Engineering and the Duke University Medical Center. Through collaborative agreements with Siemens Ultrasound, researchers in Dr. Trahey's laboratory are able to reconfigure these scanners in novel imaging modes, connect custom transducers and circuitry to these scanners, and collect raw radio-frequency data from individual elements or collections of elements during clinical or phantom trials. Students in this laboratory design custom transducer arrays, program ultrasonic scanners to implement novel methods of transmitting ultrasonic signals and processing echoes, and conduct theoretical, clinical, and phantom trials of these methods.

A major NIH-funded effort in this area looks at the ability of Acoustic Radiation Force Impulse (ARFI) imaging, to detect and characterize liver cancers and to guide minimally invasive surgeries of liver and kidney cancer. ARFI imaging was developed in Dr. Trahey's laboratory.

Other NIH-funded efforts focus on cardiovascular application of ARFI imaging. Clinical trials are underway to assess the ability of ARFI imaging to characterize vascular plaques as stable or vulnerable and to measure the stiffness of blood vessels. Ongoing trials are also being conducted to assess the ability of ARFI imaging to guide cardiac ablation surgeries and to characterize the stiffness of the myocardium throughout the cardiac cycle. Each of these efforts involves the development of novel ultrasonic pulse sequences, investigations of the physics of tissue mechanics and the propagation of sound through tissue, and the development and evaluation of novel signal and image processing methods.

#### Contact Info:

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#### Teaching (Spring 2010):

- » BME 334.01, *RADIOLOGY IN PRACTICE*  
SEE INSTRU, MW 01:15 PM-02:30 PM
- » BME 365.02, *ADVANCED ULTRASOUND*

#### Education:

PhD, Duke University, 1985  
MS, University of Michigan, 1979  
BGS, University of Michigan, 1975

#### Specialties:

Medical Imaging  
Acoustics  
Medical Instrumentation  
Medical Diagnostics

Research Interests:

Trahey's research interests include medical ultrasound, image guided surgery, adaptive imaging, imaging of tissue's mechanical properties, and radiation force imaging.

Awards, Honors, and Distinctions

Distinguished Alumni Award, University of Michigan, 2006  
Terrence Matzuk Memorial Award for Innovative Research in Ultrasonic Instrumentation, American Institute of Ultrasound in Medicine, 1988

Recent Publications (More Publications)

J. J. Dahl and D. M. Dumont and J. D. Allen and E. M. Miller and G. E. Trahey, *Acoustic radiation force impulse imaging for noninvasive characterization of carotid artery atherosclerotic plaques: a feasibility study*, *Ultrasound In Medicine And Biology*, vol. 35 no. 5 (May, 2009), pp. 707 -- 716 [abs].

G. F. Pinton and J. Dahl and S. Rosenzweig and G. E. Trahey, *A Heterogeneous Nonlinear Attenuating Full-Wave Model of Ultrasound*, *Ieee Transactions On Ultrasonics Ferroelectrics And Frequency Control*, vol. 56 no. 3 (March, 2009), pp. 474 -- 488 [abs].

R. R. Bouchard and G. van Soest and G. E. Trahey and A. F. W. van der Steen, *Optical Tracking of Superficial Dynamics from an Acoustic Radiation Force-Induced Excitation*, *Ultrasonic Imaging*, vol. 31 no. 1 (January, 2009), pp. 17 -- 30 [abs].

R. R. Bouchard and J. J. Dahl and S. J. Hsu and M. L. Palmeri and G. E. Trahey, *Image Quality, Tissue Heating, and Frame Rate Trade-offs in Acoustic Radiation Force Impulse Imaging*, *Ieee Transactions On Ultrasonics Ferroelectrics And Frequency Control*, vol. 56 no. 1 (January, 2009), pp. 63 -- 76 [abs].

B. J. Fahey and R. C. Nelson and S. J. Hsu and D. P. Bradway and D. M. Dumont and G. E. Trahey, *In vivo guidance and assessment of liver radio-frequency ablation with acoustic radiation force elastography*, *Ultrasound In Medicine And Biology*, vol. 34 no. 10 (October, 2008), pp. 1590 -- 1603 [abs].