

Timothy A. Bigelow

EMPLOYMENT

Assistant Professor

University of North Dakota
Department of Electrical Engineering

August 2005 – Present
Grand Forks, ND

- Teaching:
 - Signals and Systems – Junior level course covering analog and digital signal processing.
- Research: Ultrasound assisted therapy of biofilms and cancer, ultrasound fetal bioeffects, ultrasound assisted tumor diagnosis, acoustics.

Visiting Assistant Professor

University of Illinois
Department of Electrical and Computer Engineering

May 2004 – July 2005
Urbana-Champaign, IL

- Teaching:
 - Lines, Fields, and Waves – Junior level electromagnetism course covering TR lines, plane wave propagation, basics of waveguides, and basics of antennas.
 - Introduction to Electric and Electronic Circuits – Course for non-majors covering basic circuits (resistors, capacitors, inductors, op-amps, diodes, and transistors), physical electronics, and phasor analysis.
 - Analog Signal Processing – Sophomore level course covering basic analog RLC circuits and analog signal processing concepts.
- Research: Estimating ultrasound exposure intensity *in vivo* from backscattered waveforms for therapy and diagnostic applications, and ultrasound bioeffect studies on tissue near developing rat bone.

Graduate Research Assistant

Bioacoustics Research Laboratory
Under Dr. William D. O'Brien, Electrical and Computer Engineering at University of Illinois

January 2001 – May 2004
Urbana-Champaign, IL

- Funded by NDSEG Graduate Fellowship (1/01-8/02), Beckman Institute Graduate Fellowship (9/02-8/03), and laboratory RA (9/03-Present).

Graduate Research Assistant

Computer Vision and Robotics Laboratory
Under Dr. Narendra Ahuja, Electrical and Computer Engineering at University of Illinois

August 1999 – January 2001
Urbana-Champaign, IL

- Funded by NDSEG graduate fellowship.

Student Grader

Under Dr. Carl Nassar, Electrical Engineering at CSU

September 1998 - December 1998
Fort Collins, CO

Student Research Assistant

Applied Microwave Nondestructive Testing Laboratory
Under Dr. Reza Zoughi, Electrical Engineering at CSU

May 1997 - January 1999
Fort Collins, CO

- Perform optimization measurements on various microwave nondestructive testing (NDT) systems.
- Trained new undergraduate employees in microwave NDE measurement techniques.
- Coordinated efforts of 3-4 different undergraduates on working towards a common goal.

Student Research Assistant

Magnetic and Microwave Materials Laboratory
Under Dr. Carl Patton, Physics at CSU.

May 1995 - May 1997
Fort Collins, CO

- Perform measurements as assigned and upgrade several existing experimental systems.

FUNDED RESEARCH PROPOSALS

Beckman Institute Graduate Fellowship

Administered by the Beckman Institute for Advanced Science and Technology University of Illinois at Urbana-Champaign

September 2002 – August 2003

EDUCATION

Doctorate (Graduated May 2004)

University of Illinois

4.00 GPA

Urbana-Champaign, IL

Research: Estimating the medical ultrasound power spectrum and attenuation coefficient *in vivo* on a patient specific basis.

Courses: Advanced courses in areas of interest:

- Computational Electromagnetics
- Waves and Fields in Inhomogeneous Media
- Theory of Guided Waves
- Electromagnetic Waves and Radiating Systems

Activities: Involved with volunteer work with children through my church.

Masters (Graduated December 2001)

University of Illinois

4.00 GPA

Urbana-Champaign, IL

Research: Nonlinear Acoustics

Courses: Advanced courses in areas of interest:

- Advanced Physical Acoustics
- Ultrasonic Techniques
- Digital Imaging
- Image Processing
- Advanced Digital Signal Processing

Activities: Involved with volunteer work with children through my church.

Bachelors (Graduated December 1998) – Summa Cum Laude

Colorado State University

4.00 GPA

Fort Collins, CO

Major: Electrical Engineering

Minor: Mathematics

Courses: Advanced courses in areas of interest:

- Analog Integrated Circuits (Design course)
- Semiconductor Devices
- Optical Electronics
- Antennas and Radiation
- Microwave Theory and Component Design

Senior project also involved experimental and theoretical research with microwaves while designing a Microwave Microscope.

Activities: Involved with *Moments*, a student run Engineering and Physics journal; *Tau Beta Pi*, *Phi Kappa Phi*, *Golden Key Honor Society*, and *Eta Kappa Nu* (Honor Societies); and *S.P.S.*, the physics club on campus. Participated in volunteer work with children through my church.

HONORS/AWARDS

National Defense Science and Engineering Graduate Fellowship

Administered by the American Society for Engineering Education

August 1999 - August 2002

National Science Foundation Graduate Research Fellowship (Declined)

Administered by the National Science Foundation

March 1999

Invocation at College of Engineering Commencement

Colorado State University, Fort Collins, CO

December 1998

Phi Kappa Phi Honor Society Chapter at Colorado State University, Fort Collins, CO	December 1998
Tau Beta Pi Honor Society Delta Chapter at Colorado State University, Fort Collins, CO	April 1997
President's Sholarship(s) Administered by Colorado State University, Fort Collins, CO	August 1997 – December 1998
Colorado Merit Work Study Administered by Colorado State University, Fort Collins, CO	August 1997-December 1998
Golden Key National Honor Society	November 1996
Distinguished Scholars Award Administered by Colorado State University, Fort Collins, CO	August 1995 – December 1998
President's Valedictorian Award Administered by Colorado State University, Fort Collins, CO	August 1995
AP Scholar Administered by The College Board Advanced Placement Program	August 1995
The Outstanding Senior Science Student Award Administered by The Front Range Center for Brain and Spine Surgery, Fort Collins, CO	May 1995
Ben C. Delatour Foundation Scholar Administered by the Ben C. Delatour Foundation, Fort Collins, CO	May 1995
AWANA Citation Award	May 1995
MAA Mathematics Honor Student Award	April 1995
Tandy Technology Scholars Outstanding Student	1994-1995
National Honor Society	April 1994
National Vocational-Technical Honor Society	April 1994
Estes Industries Scholarship Awarded for Estes Model Rocket Design Competition	March 1994

COMMITEES

Beckman Student and Research Staff Advisory Committee Beckman Institute for Advanced Science and Technology University of Illinois Urbana-Champaign	Fall 2000 – June 2005 Urbana, IL
MERGE Graduate Student Recruitment Program Department of Electrical and Computer Engineering University of Illinois Urbana-Champaign	October 2002 – May 2004 Urbana, IL

PEER REVIEWED PUBLICATIONS

Bigelow, T. A., and O'Brien, W. D., Jr., "Impact of local attenuation uncertainties when estimating correlation length from backscattered ultrasound echoes," *J. Acoust. Soc. Am.*, submitted

Bigelow, T. A., and O'Brien, W. D., Jr., "Evaluation of the spectral fit algorithm as functions of frequency range and Δk_{eff} ," *IEEE Trans. Ultrason. Ferroelectr. Freq. Control.*, vol. 52, no. 11, 2003-2010, 2005.

Bigelow, T. A., and O'Brien, W. D., Jr., "Signal processing strategies that improve performance and understanding of the quantitative ultrasound SPECTRAL FIT algorithm," *J. Acoust. Soc. Am.*, vol. 118, no. 3, 1808-1819, 2005.

Bigelow, T. A., and O'Brien, W. D., Jr., "A model for estimating ultrasound attenuation along the propagation path to the fetus from backscattered waveforms," *J. Acoust. Soc. Am.*, vol. 118, no. 2, 1210-1220, 2005.

Bigelow, T. A., Oelze, M., and O'Brien, W. D., Jr., "Estimation of total attenuation and scatterer size from backscattered ultrasound waveforms," *J. Acoust. Soc. Am.*, vol. 117, no. 3, 1431-1439, 2005.

Bigelow, T. A., and O'Brien, W. D., Jr., "Scatterer size estimation in pulse-echo ultrasound using focused sources: Theoretical approximations and simulation analysis," *J. Acoust. Soc. Am.*, vol. 116, no. 1, 578-593, 2004.

Bigelow, T. A., and O'Brien, W. D., Jr., "Scatterer size estimation in pulse-echo ultrasound using focused sources: Calibration measurements and phantom experiments," *J. Acoust. Soc. Am.*, vol. 116, no. 1, 594-602, 2004.

Bigelow, T. A., and O'Brien, W. D., "Experimental evaluation of indicators of nonlinearity for voltage based linear extrapolation in ultrasound transducer characterizations," *Ultrasound in Medicine and Biology*, vol. 28, no. 11, pp. 1509-1520, 2002.

Qaddoumi, N., Bigelow, T., Zoughi, R., Brown, L., and Novack, M., "Reduction of sensitivity to surface roughness and slight standoff distance variations in microwave inspection of thick composite structures," *Materials Evaluation*, vol. 60, no. 2, pp. 165-170, 2002.

Qaddoumi, N., Handjojo, L., Bigelow, T., Easter, J., Bray, A., and Zoughi, R., "Microwave corrosion detection using open-ended rectangular waveguide sensors," *Materials Evaluation*, vol. 58, no. 2, pp. 178-184, 2000.

CONFERENCE PROCEEDINGS & PRESENTATIONS

Bigelow, T. A., and O'Brien, W. D., "Optimal value of attenuation from phantom reference when estimating correlation distance for ultrasound tissue characterization," To be presented at the *2006 American Institute of Ultrasound in Medicine Convention*, Washington, D.C., March 23-26, 2006.

Bigelow, T. A., Miller, R. J., Blue, J. P., and O'Brien, W. D., "Hemorrhage near fetal rat bone: preliminary results," Presented at the *5th International Symposium on Therapeutic Ultrasound*, Boston, Massachusetts, October 27-29, 2005.

Bigelow, T. A., Miller, R. J., Blue, J. P., and O'Brien, W. D., "Reproducibility of hemorrhage near fetal rat bone: preliminary results," Presented at the *150th Meeting of the Acoustical Society of America*, Minneapolis, Minnesota, October 17-21, 2005. (INVITED TALK)

Bigelow, T. A., and O'Brien, W. D., "A model for estimating ultrasound attenuation along the propagation path to the fetus from backscattered waveforms," Presented at the *2005 American Institute of Ultrasound in Medicine Convention*, Orlando, Florida, June 19-22, 2005.

Bigelow, T. A., and O'Brien, W. D., "Importance of local attenuation on the estimation of scatterer size from ultrasound backscattered waveforms," Presented at the *149th Meeting of the Acoustical Society of America*, Vancouver, Canada, May 16-20, 2005.

Bigelow, T. A., and O'Brien, W. D., "Experimental validation of the Spectral Fit algorithm using tissue mimicking phantoms," Presented at the *28th International Acoustical Imaging Symposium*, San Diego, California, March 20-23, 2005.

Bigelow, T. A., and O'Brien, W. D., "Estimating the thermal dose from backscattered RF echoes," Presented at the *4th International Symposium on Therapeutic Ultrasound*, Kyoto, Japan, September 18-20, 2004.

Bigelow, T. A., and O'Brien, W. D., "Importance of ka-range on the Simultaneous Estimation of Scatterer Size and Total Attenuation from Ultrasound Backscattered Waveforms," Presented at the *147th Meeting of the Acoustical Society of America*, New York, New York, May 24-28, 2004.

Bigelow, T. A., and O'Brien, W. D., "Factors Effecting Scatterer Size Estimation Using A Generalized Ultrasound Attenuation-Compensation Function to Correct for Focusing," Presented at the *146th Meeting of the Acoustical Society of America*, Austin, Texas, November 10-14, 2003.

Bigelow, T. A., and O'Brien, W. D., "Scatterer Size Estimation Using A Generalized Ultrasound Attenuation-Compensation Function to Correct for Focusing," Presented at the *2003 IEEE International Ultrasonics Symposium*, Honolulu, Hawaii, October 5-8, 2003.

Bigelow, T. A., and O'Brien, W. D., "Independent Estimation of Correlation Distance and Total Attenuation from Ultrasound Backscattered Waveforms," Presented at the *10th Congress of the World Federation for Ultrasound in Medicine and Biology*, Montreal, Canada, June 1-4, 2003.

Bigelow, T. A., and O'Brien, W. D., "Total Attenuation Estimation from Backscattered Ultrasound Waveforms," Presented at the *Biomedical Research Opportunities Workshop*, Bethesda, Maryland, Jan. 31 – Feb. 1, 2003.

Bigelow, T. A., and O'Brien, W. D., "Experimental Evaluation of Some Possible Nonlinearity Indicators," Presented at the *2002 IEEE International Ultrasonics Symposium*, Munich, Germany, Oct. 8-Oct. 11, 2002.

Qaddoumi, N., Bigelow, T., Zoughi, R., Brown, L., and Novak, M., "Removal of Standoff Distance Influence in Near-Field Microwave Inspection of Thick Stratified Composites," Presented at the *Ninth International Symposium on Nondestructive Characterization of Materials*, Sydney, Australia, June 28-July 2, 1999.

Brown, L., Novak, M., Qaddoumi, N., and Bigelow, T., "Applications of NDE Technologies to Support In-service Health Monitoring of Flexible Composite Components," Presented at the *SPIE Symposium on Nondestructive Evaluation Techniques for Aging Infrastructure Manufacturing*, Newport Beach, CA, March 1999.

Bray, A., Jenne, K. E., Qaddoumi, N., Easter, J., Bigelow, T., and Zoughi, R., "Microwave NDE Methods for Detecting Corrosion Under Shipboard Paint," Presented at the *American Society of Naval Engineers Condition-Based Maintenance Symposium*, Arlington, VA, June 30 - July 1, 1998.

Bigelow, T. A., "Complex Dielectric Constant Measurements on Microwave Ferrites," Presented at the *1996 Symposium for the Rocky Mountain Chapter of the American Vacuum Society*, Denver, CO, August 22, 1996.

PATENTS

Bigelow; T. A., Qaddoumi, N. N., Zoughi, R., and Brown, L. M., "Standoff distance variation compensator and equalizer," U.S. Patent No. 6,462,561, October 8, 2002.

TECHNICAL REPORTS/THESIS

Bigelow, T. A., "Estimating the Medical Ultrasound *In Vivo* Power Spectrum," Ph.D. dissertation, University of Illinois at Urbana-Champaign, 2004.

Bigelow, T. A., "Experimental Evaluation of Nonlinear Indices for Ultrasound Transducer Characterizations,"

M.S. thesis, University of Illinois at Urbana-Champaign, 2001.

Qaddoumi, N., Bigelow, T., Frank, M., McHardy, A., Fosdick, B., Nelson, J., and Zoughi, R., *Elimination of Sensitivity to Surface Roughness Variations in Thick Composite Deck Joints*, Final Report, Naval Surface Warfare Center, Carderock Division, Survivability, Structures, and Materials Directorate, Bethesda, MD, May 1999.

Qaddoumi, N., Bigelow, T., Ranu, E., Frank, M., Donnell, K., Smiley, R., and Zoughi, R., *Feasibility Study of Near-Field Microwave NDT Methodology for Rubber Hose Inspection*, Navy SBIR (N98-007) Phase I Subcontract Final Report, Texas Research Institute at Austin (TRI/Austin), October 1998.

Bigelow, T., *A Microwave Microscope*, EE402 Senior Design Project Final Report, Colorado State University, Fort Collins, CO, Summer 1998.

Bigelow, T., *A Microwave Microscope*, EE401 Senior Design Project Final Report, Colorado State University, Fort Collins, CO, Spring 1998.

Qaddoumi, N., Bigelow, T., Handjojo, L., Scheuerman, D., and Zoughi, R., *Theoretical Study of Thickness Variation Determination of GTR Barrier Coating Using Open-Ended Coaxial Line Sensor*, Final Report, Atrix, Ft. Collins, CO, April 1998.

Qaddoumi, N., Bigelow, T., Easter, J., Mirshahi, R., and Zoughi, R., *Microwave Inspection of Thick Composites and Deck Joints & Development of a First Generation Microwave Prototype Inspection System*, Final Report, Naval Surface Warfare Center, Carderock Division, Survivability, Structures, and Materials Directorate, Bethesda, MD, January 1998.

Qaddoumi, N., Easter, J., Bigelow, T., and Zoughi, R., *Microwave Detection of Corrosion Under Paint*, Navy SBIR (N97-056) Phase I Subcontract Final Report, Texas Research Institute at Austin (TRI/Austin), TX, October 1997.