

**TODD W. MURRAY**  
University of Colorado at Boulder  
Department of Mechanical Engineering  
427 UCB Engineering Center  
Boulder, CO



Tel: (303) 492-7236, Email: todd.murray@colorado.edu

---

## RESEARCH INTERESTS

Biomedical Optics, Optical Sensors, Nanoscale Materials Characterization, Optical Techniques for Nondestructive Evaluation, Acoustic Wave Propagation, Nanoelectromechanical Systems, Laser Ultrasonics, Materials Process Monitoring and Control, Ultrasonic Imaging, Photorefractive Materials and Devices.

---

## EDUCATION

**Johns Hopkins University** **Baltimore, MD**  
*Ph.D. Materials Science and Engineering, 1998*  
*M.S.E. Materials Science and Engineering, 1994*  
*B.S. Biomedical Engineering, 1992*

---

## EXPERIENCE

**Department of Mechanical Engineering** **Boulder, CO**  
**University of Colorado at Boulder**  
*Associate Professor (tenured), September, 2009-*  
*Director: Laser Acoustics Lab*

**Department of Mechanical Engineering** **Boston, MA**  
**Boston University**  
*Associate Professor (tenured), September, 2007- 2009*  
*Assistant Professor, August, 2001-August, 2007*

**National Institute of Standards and Technology (NIST)** **Boulder, CO**  
**Materials Reliability Division**  
*Visiting Research Scientist, September, 2007- September 2008*

**Department of Mechanical Engineering** **Evanston, IL**  
**Northwestern University**  
*Research Assistant Professor, September 2000 - July 2001*  
*Research Associate, 1999-2000*  
*Postdoctoral Research Fellow, 1998-1999*  
*Appointments under Dr. Jan Achenbach and Dr. Sridhar Krishnaswamy*

**Department of Materials Science and Engineering** **Baltimore, MD**  
**Johns Hopkins University**  
*Graduate Student/ Research Assistant, Fall 1992-Spring 1998*  
*Advisor: Dr. James Wagner*

---

## AWARDS/ PROFESSIONAL SOCIETIES

- IPPA (International Photoacoustic and Photothermal Association) Junior Research Award (2009)
- NSF *CAREER* Award Recipient (2005)
- Recipient of a Boston University *Technology Development Award* (2004)

- Recipient of a *Special Service Citation* from the AIAA for “superbly planning, organizing, and assisting with the hosting of the 2004 Region I Northeast Student Conference” (2004)
- Recipient of a Boston University College of Engineering Certificate of Appreciation (through the Class of 2006 Gift Program for making a positive impact on the life of a student)
- Recipient of a Boston University *SPRInG Award* (2002)
- Regional Editor-North America, *Journal of Nondestructive Testing and Evaluation* (2006-)
- Scientific Committee Member: 1<sup>st</sup> International Symposium on Laser Ultrasonics : Science, Technology and Applications, Montreal (July, 2008)
- Scientific Committee Member: 15th International Conference on Photoacoustic and Photothermal Phenomena (ICPPP15), Leuven, Belgium (July, 2009)
- Scientific Advisory Board: IPTRADE Inc., Newton, MA (2007-)
- Founding member: BU Center for Nanoscience and Nanobiotechnology (CNN)
- Member: NSF Center for Subsurface Sensing and Imaging Systems (CenSSIS)
- Member: Boston University Photonics Center
- Special Session Organizer and Co-Chair (w/ Ron Roy) for the 148th Meeting of the Acoustical Society of America, "Imaging in the body using sound and light" (December, 2004)
- Session Chair and Discussion Leader, "Laser Ultrasonic Processes and Applications," 2003 Gordon Research Conference on Photoacoustic and Photothermal Phenomena, Colby-Sawyer College, New London, NH (June, 2003)
- Special Session Organizer and Co-Chair (w/ Ron Roy) for the 151st Meeting of the Acoustical Society of America, "Sensing and Imaging using Light and Sound" (June, 2006)
- Chair: Special Session on Laser Ultrasonics at the 144nd Meeting of the Acoustical Society of America, (December, 2002)
- Korea University of Education and Technology, invited to present week long short-course entitled “Laser-based techniques in Nondestructive Evaluation,” (January, 2002 and August, 2002)
- Member: Acoustical Society of America, American Society of Mechanical Engineering
- Reviewer: *Optics Letters*, *Optics Express*, *Journal of the Acoustical Society of America*, *Optical Engineering*, *Applied Physics Letters*, *Research in Nondestructive Evaluation*, and *NDT&E International*, *Chemical Reviews*, *Acoustics Research Letters Online (ARLO)*, *Journal of Optics A*, *Measurement Science and Technology*.

---

## SELECTED JOURNAL PUBLICATIONS

P. Lai, R.A. Roy, T.W. Murray, “Quantitative characterization of turbid media using pressure contrast acousto-optic imaging,” *Opt. Lett.* (34) 18 (2009).

S. Bramhavar, B. Pouet, and T.W. Murray, "Superheterodyne detection of laser generated acoustic waves", *Appl. Phys. Lett.* , (94) 114102 (2009).

C. Prada, D. Clorennec, T.W. Murray, and D. Royer, “Influence of the anisotropy on zero-group velocity Lamb modes,” *J. Acoust. Soc. Am.* (126) 620 (2009).

T.W. Murray, R.A. Roy, and R.G. Holt, “Laser-Ultrasonic Cavitation,” *McGraw Hill Yearbook of Science and Technology 2008*, McGraw Hill (2008) (invited).

O. Balogun, T.W. Murray, and C. Prada, “Simulation and measurement of the optical excitation of the S1 zero group velocity Lamb wave resonance in plates,” *J. Appl. Phys.* 102, 064914 (2007)

T.W. Murray and R.A. Roy, “Illuminating sound: Imaging tissue optical properties with ultrasound,” *Acoustics Today*, 3(3) pp. 17-23 (2007). (invited)

D. Clorennec, C. Prada, D. Royer, and T.W. Murray, “Laser impulse generation and interferometer detection of zero-group velocity Lamb mode resonance,” *Appl. Phys. Lett.* 89, 024101 (2006).

- A. Kumar, T.W. Murray, and K.L. Ekinici, "Photothermal Operation of High Frequency Nano-electromechanical Systems," *Appl. Phys. Lett.* **88**, 223104 (2006).
- O. Balogun and T.W. Murray, "A Frequency Domain Laser Based Ultrasonic System for Time Resolved Measurement of Broadband Acoustic Transients," *J. Appl. Phys.* **100**,034902 (2006).
- H. Yu, O. Balogun, B. Li, T.W. Murray and X. Zhang, "Fabrication of Three-dimensional Microstructures Based on Singled-layered SU-8 For Lab-on-chip Applications," *Sensors and Actuators A: Physical*, **127**(2), pp. 228-234 (2006).
- T.L. Steen, S.N. Basu, V.K. Sarin, and T.W. Murray, "Inspection of Ceramic Coatings Using Nanoindentation and Frequency Domain Photoacoustic Microscopy," *Journal of the Korean Society of Nondestructive Testing*, **26**(6) pp. 390-402 (2006). (invited)
- Murray, T.W. and Roy, R.A., "Illuminating sound: Imaging tissue optical properties with ultrasound," *Echoes* **16**(4), pp. 1-3, (2006). (invited).
- C. Prada, O. Balogun and T.W. Murray, "Laser Based Ultrasonic Generation and Detection of Zero Group Velocity Lamb Waves in Thin Plates," *Appl. Phys. Lett.*, **87**, 194109 (2005).
- T.W. Murray, O. Balogun, T.L. Steen, S. N. Basu and V. K. Sarin, "Inspection of Compositionally Graded Mullite Coatings Using Laser Based Ultrasonics", *International Journal of Refractory and Hard Materials*, **23**, pp. 322-329 (2005).
- L. Sui, R. A. Roy, C. A. DiMarzio, and T. W. Murray, "Imaging in Diffuse Media using Pulsed-Ultrasound-Modulated Light and the Photorefractive Effect," *Appl. Opt.* **44** (19), pp. 4041-4048 (2005).
- E. Bossy, L. Sui, T. W. Murray, and R. A. Roy, "Fusion of conventional ultrasound imaging and acousto-optical imaging using a standard pulsed ultrasound scanner," *Opt. Lett.* **30** (7), pp. 744-746, (2005).
- F. J. Blonigen, A. Nieva, C. A. DiMarzio, S. Manneville, L. Sui, G. Maguluri, T. W. Murray, and R. A. Roy, "Computations of the acoustically-induced phase shifts of optical paths in acousto-phonic imaging with photorefractive-based detection", *Appl. Opt.* **44**(18), pp. 3735-3746 (2005).
- C. Farny, T. Wu, R.G. Holt, T.W. Murray, and R.A. Roy, "Nucleating Cavitation from Laser Illuminated Nanoparticles," *Acoust. Res. Lett. Online* **6**(3), pp. 138-143 (2005).
- T. W. Murray, L. Sui, G. Maguluri, R. A. Roy, A. Nieva, F. Blonigen and C. A. DiMarzio, "Detection of Ultrasound Modulated Photons in Diffuse Media Using the Photorefractive Effect," *Opt. Lett.* **29** (21), pp. 2509-2511, (2004).
- T.W. Murray and O. Balogun, "High sensitivity laser based acoustic microscopy using a modulated laser source," *Appl. Phys. Lett.* **85**(14), pp. 2974 (2004).
- H. Yu, O. Balogun, B. Li, T.W. Murray and X. Zhang, "Building embedded microchannels using a single layered SU-8, and determining Young's modulus using a laser acoustic technique," *J. Micromech. Microeng.* **14**(11), pp. 1576 (2004).
- C.A. DiMarzio and T.W. Murray, "Medical Imaging Techniques Combining Light and Ultrasound," *Subsurface Sensing Technologies and Applications*, **4**(4), pp. 289-309 (2003).
- T.W. Murray and O. Balogun, "Laser ultrasonic inspection of environmental barrier coatings," *Journal of the Korean Society of Nondestructive Testing*, **22**(6) pp. 599-608 (2002). (Invited)

Y. Zhou, T.W. Murray, and S. Krishnaswamy, "Photoacoustic imaging of surface acoustic wave slowness using multiplexed two-wave mixing interferometry," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, **49**(8), pp. 1118-1123 (2002).

P. Fomitchov, T.W. Murray, and S. Krishnaswamy, "Intrinsic fiber-optic ultrasonic sensor array using multiplexed two-wave mixing interferometry," *Applied Optics*, **41**(7) pp. 1262-1266 (2002).

C. Hernandez, T.W. Murray, and S. Krishnaswamy, "Photo-acoustic characterization of the Mechanical Properties of Thin Films," *Appl. Phys. Lett.* **80** (4), pp. 691-693 (2002).

T.W. Murray and S. Krishnaswamy, "Multiplexed interferometer for ultrasonic imaging applications," *Optical Engineering* **40**(7), pp.1321-1328 (2001).

A. Cheng, T.W. Murray, and J.D. Achenbach, "Simulation of laser generated ultrasonic waves in layered plates," *J. Acoust. Soc. Am.* **110**(2), pp. 848-855 (2001).

T.W. Murray, H. Tuovinen, and S. Krishnaswamy, "Adaptive optical array receivers for detection of surface acoustic waves," *Applied Optics* **39**(19), pp. 3276-3284 (2000).

T.W. Murray, S. Krishnaswamy, and J.D. Achenbach, "Laser generation of ultrasound in films and coatings," *Appl. Phys. Lett.* **74**(23), pp.3561-3563 (1999).

T.W. Murray and J.W. Wagner, "Laser generation of acoustic waves in the ablative regime," *J. Appl. Phys.* **85**(4), pp. 2031-2040 (1999).

D.H. Hurley, J.B. Spicer, J.W. Wagner, and T.W. Murray, "Investigation of the anisotropic nature of laser-generated ultrasound in zinc and unidirectional carbon epoxy composites," *Ultrasonics* **36**(1-5), pp. 355-360 (1998).

T.W. Murray, K.C. Baldwin and J.W. Wagner, "Laser ultrasonic chirp sources for low damage and high detectability without loss of temporal resolution," *J. Acoust. Soc. Am.* **102**(5), pp. 2742-2746 (1997).

T.W. Murray, J.B. Deaton Jr., and J.W. Wagner, "Experimental evaluation of enhanced generation of ultrasonic waves using an array of laser sources," *Ultrasonics* **34**, pp. 69-77 (1996).

J.S. Steckenrider, T.W. Murray, and J.W. Wagner, and J.B. Deaton, "Sensitivity enhancement in laser ultrasonics using a versatile laser array system," *J. Acoust. Soc. Am.*, **97**(1), pp. 273-279 (1995).

---

## LAY LANGUAGE PAPERS/ POPULAR PRESS

A. SampathKumar, K.L. Ekinici and T.W. Murray, "Sound from Light: Playing Notes on Nanoscopic Wires" invited lay language paper prepared for the Acoustical Society of America, 151st Meeting Press Release (2006)

New Scientist Tech Reports, "Laser beams pluck nanostrings" by Jeff Hecht available online at [www.newscientist.com](http://www.newscientist.com) (June, 2006)

Medical Device & Diagnostic Industry Magazine (MD&DI), R&D Digest, "Nanostrings on pitch for measuring viruses," by Heather Thompson (October, 2006)

Acoustical Society of America 151st Meeting Press Release: "Viewing Nanomachines with a Photoacoustic Microscope" (May, 2006)

Biophotonics International Magazine "Acoustic microscopy measures nanoscale structures" by Kate Leggett (December, 2004)