

# Jason E. Mitchell, PhD, PE

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<b>Education</b>	August 2014	Vanderbilt University	Nashville, TN
	<b>Ph.D. (Mechanical Engineering)</b>		
	<ul style="list-style-type: none"><li>Thesis title: <i>Design of Modular Self Contained Knee and Ankle Prostheses</i></li></ul>		
	August 2002	Vanderbilt University	Nashville, TN
	<b>M.S. (Mechanical Engineering)</b>		
	<ul style="list-style-type: none"><li>Awarded Naval Joining Center fellowship to conduct research in friction stir welding.</li><li>Thesis title: <i>The Experimental Thermo-mechanics of Friction Stir Welding</i></li></ul>		
	May 1999	Tennessee Technological University	Cookeville, TN
	<b>B.S. (Mechanical Engineering)</b> emphasis in Machine Design		
	<ul style="list-style-type: none"><li>Dean's List Fall 94, Spring 95, Fall 98, and Spring 99</li></ul>		
<b>Professional Experience</b>	January 2006 – Present	Vanderbilt University	Nashville, TN
	<b>Research Assistant Professor of Mechanical Engineering and Otolaryngology</b>		
	<b>R&amp;D Engineer / Lecturer</b>		
	<ul style="list-style-type: none"><li>Currently teach Senior Design Capstone Course in the Mechanical Engineering Department. Previously taught Introduction to Finite Element Analysis, Machine Analysis and Design, and Kinematics.</li><li>Lead mechanical designer for electrically powered prosthetic leg with active knee and ankle joints. Several patents have been applied for as a result of this work and the technology has been licensed to a private company for commercial development.</li><li>Worked with a team of physicians and engineers to design, fabricate, and validate various medical devices used in minimally invasive ear surgery. These devices have been used to perform the world's first percutaneous cochlear implantation.</li><li>Designed a seven link dynamic walking biped robot.</li><li>Serve on department ABET committee</li></ul>		
	July 2004-July 2006	Trane Co.	Clarksville, TN
	<b>Process Engineer</b>		
	<ul style="list-style-type: none"><li>Worked as part of a team to design and install a facility to manufacture the IntelliPAK II product, a 70-130 ton rooftop HVAC unit.</li><li>Responsible for the assembly and handling of 12 ft by 50 ft base and roof sub assemblies of the unit employing engineering and statistical analysis. This included manufacturing cell layouts, part flow, and method sheets for assemblies.</li><li>Directly responsible for \$2.4M worth of capital equipment, including conceptual design, specifications, design approval, and installation of all equipment in the base/roof cell.</li></ul>		
	January 2002-June 2003	Electroimpact, Inc.	Mukilteo, WA/Chester, UK
	<b>Mechanical Engineer</b>		
	<ul style="list-style-type: none"><li>Designed flexible fixturing to hold wing panels during automated assembly of the Airbus A320, A340, and variants. Fixture was unique in that it had to be adjustable to allow many different wing panels to be mounted on one jig while maintaining a high level of positional accuracy and repeatability.</li><li>Traveled to Chester, United Kingdom for installation and was in charge of fixture alignment using a MSX laser tracker. Fixture installation involved extensive hands on assembly and troubleshooting.</li></ul>		

<b>Military Experience</b>	<p>January 1996-January 2004 <b>Corporal</b></p> <ul style="list-style-type: none"> <li>▪ Served as fire team leader, supervising three other Marines in my team.</li> <li>▪ Awarded Marine of the Year of India Company for 1997.</li> <li>▪ Honorably discharged January 2004</li> </ul>	USMC Reserves	Nashville, TN
	<p>October 2012 - Present <b>Lieutenant</b></p> <ul style="list-style-type: none"> <li>▪ Engineering Duty Officer/Diving and Salvage Officer</li> <li>▪ Executive Officer of NAVSEA Reserve Dive Norfolk</li> </ul>	USN Reserves	Norfolk, VA
<b>Professional Registration / Certification</b>	<p><b>Professional Engineer - Mechanical Engineering, Tennessee</b></p> <p><b>Six Sigma Green Belt</b> - (American Standard / Trane Certification)</p>		
<b>Publications</b>	<p>Wellborn, P., <b>Mitchell, J.</b>, Webster, R. "Miniaturized Magnetorheological Brake with High Torque and Fast Response." <i>IEEE Transactions on Mechatronics</i>, In Review (2019)</p> <p>Dillon, N.P., Fichera, L., Kesler, K., Zuniga, <b>Mitchell, J.</b>, Webster, R., Labadie, R. "Pre-operative Screening and Manual Drilling Strategies to Reduce the Risk of Thermal Injury During Minimally Invasive Cochlear Implantation Surgery," <i>Annals of Biomedical Engineering</i> 45(1), (may 2017)</p> <p>Bennett, D. A., <b>Mitchell, J.E.</b>, Truex, D., Goldfarb, M., "Design of a Myoelectric Transhumeral Prosthesis," <i>IEEE/ASME Transactions on Mechatronics</i>, vol. 21, no. 4, pp. 1868-1879, (aug 2016)</p> <p>Lawson, B. E. <b>Mitchell, J.E.</b>, Truex, D., Shultz, A., Ledoux, E., Goldfarb, M. "A Robotic Leg Prosthesis: Design, Control, and Implementation," <i>IEEE Robotics &amp; Automation Magazine</i>, vol. 21, no. 4, pp. 70-81, (dec 2014)</p> <p>Balachandran, R., Fritz, M.A., Dietrich, M.S., Danilchenko, A., <b>Mitchell, J.E.</b>, "Clinical testing of an alternate method of inserting bone-implanted fiducial markers," <i>International Journal of Computer Assisted Radiology and Surgery</i> 9 (5), 913-920 2014</p> <p>Labadie, R.F., Balachandran, R., Noble, J.H., Blachon, G.S., <b>Mitchell, J.E.</b> "Minimally invasive image-guided cochlear implantation surgery: First report of clinical implementation," <i>The Laryngoscope</i> 124 (8), 1915-1922 (2014)</p> <p>Balachandran, R., Noble, J.H., Blachon, G., <b>Mitchell, J.E.</b>, Reda, F.A., Dawant, B.M., "Computer Assisted ENT Surgery," <i>International Journal of Computer Assisted Radiology and Surgery</i> 8 (1), S101-S107 (2013)</p> <p>McRackan, T.R., Balachandran, R., Blachon, G.S, <b>Mitchell J.E.</b>, Noble, J.H., "Validation of minimally invasive, image-guided cochlear implantation using Advanced Bionics, Cochlear, and Medel electrodes in a cadaver model", <i>International journal of computer assisted radiology and surgery</i> 8 (6), 989-995 (2013)</p> <p>Braun, D.J., <b>Mitchell, J.E.</b>, Goldfarb, M., "Actuated Dynamic Walking in a Seven-Link Biped Robot," in <i>IEEE/ASME Transactions on Mechatronics</i>, vol. 17, no. 1, pp. 147-156, (feb 2012)</p> <p>Wanna, G.B., Balachandran, R., Majdani, O., <b>Mitchell, J.E.</b>, Labadie, R.F. "Percutaneous access to the petrous apex in vitro using customized micro-stereotactic frames based on image-guided surgical technology" <i>Acta oto-laryngologica</i> 130 (4), 458-463 2010</p> <p>Balachandran, R., Mitchell, J.E., Blachon, G., Noble, J.H., Dawant, B.M., "Percutaneous cochlear implant drilling via customized frames: an in vitro study," <i>Otolaryngology-Head &amp; Neck Surgery</i> 142 (3), 421-426 (2010)</p>		

**Mitchell, J.E.**, Labadie, R.F., Fitzpatrick, J.M., "Design of a Novel Device to Provide Assured Seating of Bone Implanted Fiducial Markers," *ASME Journal of Medical Devices*, Volume 4, Issue 2, June 2010.

Labadie, R.F. Balachandran R., **Mitchell J.E.**, Noble J.H., Majdani O., Dawant B.M., Bennet M., Haynes D.S., Fitzpatrick J.M. "Clinical Validation Study of Percutaneous Cochlear Access Using Patient Customized Micro-Stereotactic Frames," *Otology & Neurotology*, 31(1):94-99 (jan 2010)

Braun, D.J., **Mitchell, J.E.**, Goldfarb, M., "Actuated Dynamic Walking in a Seven-link Biped Robot," *IEEE Transactions on Mechatronics*, ODI: 10.1109/TMECH.2010.2090891, (2010)

Balachandran, R., **Mitchell, J.E.**, Dawant, B.M., Fitzpatrick, J. M., "Accuracy Evaluation of Microtargeting Platforms for Deep-Brain Stimulation Using Virtual Targets," *IEEE Transactions on Biomedical Engineering*. Vol. 56, No1, (jan 2009)

Labadie R.F., **Mitchell J.E.**, Balachandran R., Fitzpatrick J.M. "Customized, Rapid-Production Microstereotactic Table for Surgical Targeting: Description of Concept and In-vitro Validation," *International Journal of Computer Assisted Radiology and Surgery*, (may 2009)

Balachandran R., Majdani O., Noble, J.H., **Mitchell, J.E.**, Dawant, B.M., Fitzpatrick, J.M., Labadie, R.F., "Percutaneous cochlear implant drilling via customized frames," *Otolaryngology - Head and Neck Surgery*, Volume 141, Issue 3, Supplement 1, Page P89 (sep 2009)

Labadie, R.F., *Mitchell, J.E.* Balachandran, R., Fitzpatrick, J.M., "Customized, rapid-production microstereotactic table for surgical targeting: description of concept and in vitro validation," *International journal of computer assisted radiology and surgery* 4 (3), 273-280 (2009)

Sup, F., Varol, H.A., **Mitchell, J.E.**, Withrow T.J., and Goldfarb, M., "Preliminary Evaluations of a Self-Contained Anthropomorphic Transfemoral Prosthesis," *IEEE/ASME Transactions on Mechatronics*, vol. 14, no. 6, pp. 667-676, (2009)

Fite, K.B., Withrow, T.J., Shen, X., Wait, K.W., **Mitchell, J.E.**, Goldfarb, M., "A Gas-Actuated Anthropomorphic Prosthesis for Transhumeral Amputees," *IEEE Transactions on Robotics*, Volume 24, Issue 1 Page(s):159 – 169 (feb 2008)

Fite, K.B., **Mitchell, J.E.**, Barth, E.J., and Goldfarb, M. "A Unified Force Controller for a Proportional-Injector Direct-Injection Monopropellant-Powered Actuator," *ASME Journal of Dynamic Systems, Measurement and Control*, vol. 128, no. 1, pp. 159-164, (2006)

Lambrakos, S.G., Fonda, R.W. Milewski, J.O. and **Mitchell J.E.**, "Analysis of Friction Stir Welds Using Thermocouple Measurements," *The Science and Technology of Welding and Joining*, Vol. \* No. 5 , 385-390. (2003)

Cook, G.E., Smartt, H.B., **Mitchell, J.E.**, Strauss, A.M., and Crawford, R., "Controlling Robotic Friction Stir Welding," *Welding Journal*, 82 (6), pp 28-34 (2003) (Awarded A.F. Davis Silver Medal)

#### Conference Proceedings

Riojas, K.E., Narasimhan, N., Morrel, W.G., **Mitchell, J.E.**, Bruns, T., Webster III R.J., and Labadie R.F., "A New Manual Insertion Tool for Minimally Invasive, Image-Guided Cochlear Implant Surgery." *SPIE Medical Imaging* (feb 2019)

Amack, S., Rox, M., Mitchell, J., Ertop, T., Emerson, M., Kuntz, A., Maldonado, F., Akulian, J., Gafford, J., Alterovitz, R., Webster, R., "Design and Control of a Compact, Modular Robot for Transbronchial Lung Biopsy" *SPIE Medical Imaging* (feb 2019)

Narasimhan, N., Riojas, K.E., Bruns, T., **Mitchell, J.E.**, Webster, R.J., III, and Labadie, R.F., "A simple manual roller wheel insertion tool for electrode array insertion minimally invasive cochlear implant surgery." *Proceedings of the 2019 Design of Medical Devices Conference DMD2019* Minneapolis, MN, USA (apr 2019)

Zuniga, G., Kesler, K., Dillon, N., Fichera, L., **Mitchell, J.**, Labadie, R., "Heat Generated During Temporal Bone Drilling, Is the facial Nerve at Risk?" *Presented at COSM*, San Diego, (apr 2017)

Zuniga M.G., Kesler, K.K., Fichera, L, Dillon, N.P., **Mitchell J.E.**, Labadie, R.F. "Measurement of temperature during mastoidectomy: Is the facial nerve at risk?" *24th Annual Resident Research Competition*, Vanderbilt University Medical Center. Nashville, TN USA (2016, June). First Place Winner

Dillon, N.P., **Mitchell, J.E.**, Fichera, L., Webster, R.J., Labadie, R.F., "Image-guided, minimally invasive cochlear implantation using customized microstereotactic frames," *Southeastern Medical Device Association Conference* (2016, May).

Fichera, L., Dillon, N.P., Kesler, K., Zuniga, M.G., Mitchell, J.E, Labadie, R.F., "Thermal monitoring of the facial recess during drilling for minimally invasive cochlear implantation: comparison of manual and automated approaches," *20th Annual Conference of the International Society for Computer Aided Surgery* (2016, June). Koh Young - ISCAS Young Investigator Scholarship Award.

Dillon, N.P., **Mitchell, J.E.**, Zuniga, M.G., Webster, R.J., Labadie, R.F., "Design and Thermal Testing of an Automatic Drill Guide for Less Invasive Cochlear Implantation," *Design of Medical Devices Conference* (2016, April).

Dillon, N.P., Siebold, M.A., **Mitchell, J.E.**, Fitzpatrick, J.M., Webster, R.J., "Increasing Safety of a Robotic System for Inner Ear Surgery Using Probabilistic Error Modeling Near Vital Anatomy," *SPIE Medical Imaging* (2016, February). Young Scientist Award Presented by Siemens, Runner-Up

Dillon, N.P., Siebold, M.A., **Mitchell, J.E.**, Blachon, G.S., Balachandran, R., Fitzpatrick, J.M., Webster, R.J., "Increasing safety of a robotic system for inner ear surgery using probabilistic error modeling near vital anatomy," *Medical Imaging 2016: Image-Guided Procedures, Robotic Interventions, and Modeling.*" Volume 9786 Pages 97861G (2016)

Bennett, D.A., **Mitchell, J.E.**, Goldfarb, M., "Design and characterization of a powered elbow prosthesis," in *Engineering in Medicine and Biology Society (EMBC)*, 2015 37th Annual International Conference of the IEEE , vol., no., pp.2458-2461, 25-29 (aug 2015)

Shultz, A. H., **Mitchell, J. E.**, Truex, D., Lawson, B. E., Ledoux, E., and Goldfarb, M. "A walking controller for a powered ankle prosthesis," *Conference proceedings : ... Annual International Conference of the IEEE Engineering in Medicine and Biology Society.* 6203-6 (2014)

Shultz, A.H., **Mitchell, J.E.**, Truex, D., Lawson, B.E., Goldfarb, M., "Preliminary evaluation of a walking controller for a powered ankle prosthesis," *IEEE international conference on Robotics and automation (ICRA)*, 4838-4843, (2013)

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Balachandran, R., **Mitchell, J.E.**, Noble, J., Blachon, G., Lipscomb, W., Schurzig, D., Haynes, D.S., Bennett, M.L., Majdani, O., Dawant, B.M., Fitzpatrick, J.M., Labadie, R.F., "Percutaneous Cochlear Implantation via Image-Guided Customized Frames." *Journal Workshop on Enabling Technologies for Image-Guided Robotic Interventional Procedures* (jun 2010)

Braun, D.J., **Mitchell, J.E.**, Goldfarb, M., "Actuated Dynamic Walking in Biped Robots: Control Approach, Robot Design and Experimental Validation," *9th IEEE-RAS International Conference on Humanoid Robots* Paris, France (dec 2009)

Sup, F., Huseyin, A.V., **Mitchell, J.**, Withrow, T.J., "Self-Contained Powered Knee and Ankle Prosthesis" Initial Evaluation on a Transfemoral Amputee," *Proceedings of the International Conference on Rehabilitation Robotics.* Kyoto Japan (2009) Best Paper Award

Balachandran, R., **Mitchell, J.**, Dawant, B., Fitzpatrick, J.M., "Evaluation of targeting frames for deep-brain stimulation using virtual targets." *Conference Biomedical Imaging: From Nano to Macro, 2007. ISBI 2007. 4th IEEE International Symposium* Pages 1184-1187 (apr 2007)

Fite, K.B., Withrow, T.J., Shen, X., Wait, K., Mitchell, J., Goldfarb, M. Progress," Rehabilitation Robotics, 2007. IEEE 10th International Conference on Rehabilitation Robotics. ICORR (2007)

## Patents

Goldfarb, M., **Mitchell, J.**, Huseyin, A.V., Lawson, B.E., Truex, D., "Parallelogram load cell," , U.S. Patent Number 10,111,762, October 30, 2018

Goldfarb, M., Shultz, A.H., Lawson, B.E., **Mitchell, J.E.**, Truex, D., "Walking controller for powered ankle prostheses," , U.S. Patent Number 10,016,290, July 10, 2018

Goldfarb, M., **Mitchell, J.**, Spool and body architectures for three-position directional control valves", U.S. Patent Number 9,803,758, October 31, 2017

Goldfarb, M., **Mitchell, J.**, "Directional control valve with spool delay mechanism", U.S. Patent Number, 9,599,248, March 21, 2017

Goldfarb, M., Varol, H.A., Sup IV, F.C. **Mitchell, J.E.**, Withrow, T.J., "Powered leg prosthesis and control methodologies for obtaining near normal gait," Patent Number 9,289,315., March 22, 2016

Goldfarb, M., Varol, H.A., Sup IV, F.C. **Mitchell, J.E.**, Withrow, T.J., "Powered leg prosthesis and control methodologies for obtaining near normal gait," Patent Number 9,180,025., November 10, 2015

Goldfarb, M., Varol, H.A., Sup IV, F.C., **Mitchell, J.E.**, Withrow, T.J., "Powered leg prosthesis and control methodologies for obtaining near normal gait," Patent Number 8,986,396., March 24, 2015

**Mitchell, J.E.**, Labadie, R.F., Fitzpatrick, J.M., "Microstereotactic table," U.S. Patent Number 8,771,290 July 8, 2014

Labadie, R., Fitzpatrick, M., **Mitchell, J.**, Blachon, G., Toennies, J., Webster, III; R., Withrow, Thomas, J. "Apparatus and methods for percutaneous cochlear implantation", Patent Number 8,886,331., November 11, 2014

Goldfarb, M., Varol, H.A., Sup IV, F.C. **Mitchell, J.E.**, Withrow, T.J., "Powered leg prosthesis and control methodologies for obtaining near normal gait," Patent Number 8,652,218., February 18, 2014

Fitzpatrick, J.M., Labadie, R.F., and **Mitchell, J.E.**, "Anchor Driver with Assured Seating," U.S. Patent Number 8,231,636 July 31, 2012

Labadie, R.F., Fitzpatrick, J.M., and **Mitchell, J.E.**, "Adjustable surgical platform and surgical instrument using same," U.S. Patent Number 7,981,122 B2. July 19, 2011

Goldfarb, M., Barth, E.J., Fite, K.B., and **Mitchell, J.E.**, "Method and Apparatus for High Bandwidth Rotary Servo Valves," U.S. Patent Number 7,322,375, January 29, 2008

## Sponsored Research

**Project Title:** "Development and Testing of Ultrasonic Sensing and Visualization System for Divers in Zero Visibility Water Enhanced Submarine Escape and Rescue"

**Funding Agency:** Naval Sea Systems Command, Supervisor of Salvage

**Investigator Role:** P-I

**Total budget for life of program:** \$1,695,373.15

**Dates of funding:** 03/01/2019 to 02/31/21

**Project Title:** Bronchoscopic Steerable Needles for Transparenchymal Access to Lung Nodules

**Funding Agency:** NIH/NIBIB

**Grant Type:** RO1

**Investigator Role:** Co-I

**Dates of Funding:** 9/1/17-8/31/21

**Total Direct Costs:** \$139,751

**Project Title:** Clinical Validation and Testing of Percutaneous Cochlear Implantation

**Funding Agency:** NIH/NIDCD

**Grant Type:** RO1

**Investigator Role:** Co-I

**Dates of Funding:** 7/13/12 – 6/30/21  
**Total Direct Costs:** \$380,948

**Project Title:** Clinical Validation and Testing of Percutaneous Cochlear Implantation  
**Funding Agency:** NIH/NIDCD  
**Grant Type:** RO1  
**Investigator Role:** Co-I  
**Dates of Funding:** 07/01/2006 – 1/30/2018  
**Total Direct Costs:** \$3,088,215

**Project Title:** Safe, Rapid Access to the Internal Auditory Canal for Acoustic Neuroma  
**Funding Agency:** NIH/NIDCD  
**Grant Type:** RO1  
**Investigator Role:** Co-I  
**Dates of Funding:** 04/01/2013 – 1/31/2018  
**Total Direct Costs:** \$360,290

**Project Title:** Design and Test Energy-Saving Valve Components and Prototypes  
**Funding Agency:** Aerovalve LLC –  
**Grant Type:** Sponsored Research from private company  
**Investigator Role:** Key study personnel  
**Dates of Funding:** 01/1/2015 – 12/31/2015  
**Total Direct Costs:** \$64,300

**Graduate  
Students Co-  
Advised**

Nima Sarli, Ph.D. 2018 Thesis Title “Design, Modeling and Control of Continuum Robots and Dexterous Wrists with Applications to Transurethral Bladder Cancer Resection.”

Stephanie Amack M.S. 2019 Thesis Title “Design and Implementation of Bronchoscopic Steerable Needles for Transparenchymal Access to Lung Nodules.”

**References**

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Robert F. Labadie, MD, PhD, MMHC, FACS  
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