

# Laurel Kuxhaus

Assistant Professor of Mechanical and Aeronautical Engineering  
Clarkson University  
8 Clarkson Ave., Box 5725  
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315.268.6602 lkuxhaus@clarkson.edu

## EDUCATION:

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UNIVERSITY OF PITTSBURGH      *Pittsburgh, PA 15213*      August 2003-April 2008

- Ph.D. in Bioengineering earned April, 2008.
  - Dissertation: “Development of a feedback-controlled elbow simulator: design validation and clinical application.”
  - Orthopaedic Biomechanics Laboratory      January 2005-present
    - Advisor: Jeffrey S. Vipperman, Ph.D.
    - Research Supervisor: Mark C. Miller, Ph.D.
  - Hand Research Laboratory,      August 2003-December 2004;
    - Advisor: Zong-Ming Li, Ph.D.
    - Research Topics: Thumb force production; Wrist kinematics.
- QPA: 3.59/4.0

CORNELL UNIVERSITY      *Ithaca, NY 14853*      August 2001-August 2003

- M.S. in Mechanical Engineering earned August, 2003.
  - Thesis: “Changes in Thumb 3D Force Production With Selective Paralysis.”
  - Neuromuscular Biomechanics Laboratory
    - Advisor: Francisco J. Valero-Cuevas, Ph.D.
- GPA: 3.41/4.0;
- Cornell University/Hospital for Special Surgery Summer Immersion Term:      Summer, 2002
  - Highlights of this six-week program included a Soft Tissue Mechanics course and an Implant Retrieval Study.

MICHIGAN STATE UNIVERSITY      *East Lansing, MI 48824*      August 1996-May 2001

- B.S. in Engineering Mechanics earned May 2001, with Honors.
  - Senior project: “A dual-vector approach to a three-dimensional coordinate system for the human wrist”.
    - Advisors: Clarence L. Nicodemus, Ph.D.; Robert Soutas-Little, Ph.D.
- B.A. in Music earned May 2001, with Honors.
- GPA: 3.56/4.0; Graduate of the Honors College.

## TEACHING EXPERIENCE:

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ASSISTANT PROFESSOR      July, 2009-present

*Department of Mechanical and Aeronautical Engineering, Clarkson University, Potsdam NY*

- ME/ES 380 – Biomechanics (Fall, 2009).
  - 25 students total (21 undergraduate, 4 graduate)
  - Overall Teaching Effectiveness: 4.5/5.0 (Clarkson University Average: 4.2/4.0)
- ES 220 – Statics (Spring, 2010).
  - 58 students total (58 undergraduate)

### STUDENTS SUPERVISED AT CLARKSON UNIVERSITY

*Department of Mechanical and Aeronautical Engineering, Clarkson University, Potsdam NY*

- Sisi Zeng (MS expected April 2011) August, 2009-present
  - Development of an Elbow Stiffness Tester.
- Charles Weisenbach January, 2010-present  
(BS Mech. Eng. earned April 2010; MS Comput. Bio. Expected April 2012)
  - Curve-fitting of ligament strain data.
- Nathan Pepin (BS Mech. Eng. earned April 2010) January, 2010-present
  - Development of an alignment device for an elbow stiffness tester.
- Max Chepunek (BS Biomolecular Science expected April 2011) January, 2010-present
  - Parkinson's Disease and Elbow Stiffness.
- Nicole Corbiere January, 2010-present  
(BS Mech. Eng. earned April 2010; MS Mech. Eng. Expected April 2012)
  - MicroCT scanning of human vertebrae
- Andrew Bluestein May, 2010-present  
(BS Mech. Eng. and BS Physics Expected April, 2012)
  - Hardware support for Elbow Stiffness Tester; Webpage design.

### FRESHMEN ENGINEERING ADJUNCT FACULTY

August 2008-December 2008

*Freshmen Engineering Program, University of Pittsburgh*

- Instructor, Introduction to Engineering Analysis (ENGR 0012).
  - Course topics include basic programming skills in MATLAB and C++ and both oral and written technical presentation skills.

### UNDERGRADUATE SENIOR PROJECTS SUPERVISED:

*Department of Mechanical Engineering and Materials Science, University of Pittsburgh*

- *Completion of an isometric elbow follower and its redesign into an isokinetic follower.* Spring 2008
  - Jason Fitzwater, Melissa Neely, and Louis Magnotta.
- *Design of a device to measure isometric forearm strength* Fall 2007
  - Robert Barbish, Jose Bernado, Jim Coyne, Peter McKeon.
- *Reconfiguring a Servocontrolled knee simulator, Phase I* Spring 2006
  - Blythe Andrews, Brad Boyerinas, David Roeser, John Sheridan, Brian Sattler.
- *Closed-loop control fixture for simulated elbow and wrist motion* Fall 2006
  - Phillip Hobbins, Randy Longo, Richard Whalen.
- *A six-DOF physical model of the elbow for use in a joint simulator* Summer 2006
  - Justin Calugar, Herb Hewitt, Timothy Pournaras.

### MECHANICAL ENGINEERING TEACHING ASSISTANT

May 2006-August 2006

*Department of Mechanical Engineering and Materials Science, University of Pittsburgh*

- Supervised undergraduate students in Engineering Design. Duties included guiding students through the design process to create a physical model elbow and 'axis finder'.

### BIOENGINEERING TEACHING ASSISTANT

January 2006-April 2006

*Department of Bioengineering, University of Pittsburgh*

- Assisted in the teaching of Bioengineering Methods Laboratory to undergraduate students. Duties included assisting with laboratory exercises and grading.

### MATHEMATICS TEACHING ASSISTANT

August 2000-May 2001

*Department of Mathematics, Michigan State University*

- Assisted in the teaching of Calculus II to undergraduate students. Duties included creating and grading weekly quizzes and teaching responsibilities.

MATHEMATICS AND SCIENCES TUTOR

August 1997-May 2000

*Student-Athlete Support Services, Michigan State University*

- Assisted student-athletes in a wide range of math and engineering courses.

**FUNDED GRANTS:**

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THE PITTSBURGH FOUNDATION

*Albert B. Ferguson, M.D. Orthopaedic Fund*

July 2008-July 2009

*“Quantifying strain in the medial ulnar collateral ligament of the elbow.”*

Investigator: Laurel Kuxhaus

Amount: \$5000

CLARKSON UNIVERSITY – COULTER SCHOOL OF ENGINEERING *SEED Fund*

June 2010-May 2011

*“Developing a mathematical model of elbow ligament strain.”*

Investigator: Laurel Kuxhaus

Amount Requested: \$6000; Amount Funded: \$5500

**PENDING FUNDING:**

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DEPARTMENT OF DEFENSE

*W81XWH-10-PRMRP-TTDA*

January 2011-January 2015

*“One step at a time: model-based predictions to promote bone microarchitectural growth through walking.”*

*Principal Investigator:* James J. Carroll

*Requested Amount:* \$1,280,495

*Role:* Co-PI

AIRLIFT RESEARCH FOUNDATION

January 2011-December 2012

*“Contribution of elbow joint structures to overall joint stiffness.”*

*Role:* PI

*Requested Amount:* \$200,000

*Senior Collaborator:* Charles J. Robinson

**PUBLICATIONS:**

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MANUSCRIPTS IN PREPARATION:

Tanaka M, Weisenbach CA, Miller MC, **Kuxhaus L**. (In Preparation) “A continuous method to quantify material properties of ligaments, tendons, and other viscoelastic materials”.

MANUSCRIPTS IN REVIEW:

Sotereanos NG, Hofer A, Wohlrab D, **Kuxhaus L**, Miller MC. (In Review) “Subsidence in two uncemented femoral stems: an in vitro study”. *Submitted to J Arthroplasty, August 2010.*

MANUSCRIPTS:

**Kuxhaus L**, Schimoler PJ, Viperman JS, Miller MC. (2009) “Validation of a Feedback-Controlled Elbow Simulator Design: Elbow Muscle Moment Arm Measurement”. *ASME Journal of Medical Devices*, **3**(1), 021002:1-7.

**Kuxhaus L**, Schimoler PJ, Viperman JS, Baratz ME, Miller MC. (2009) “Effects of Camera Switching on Fine Accuracy in a Motion Capture System.” *ASME Journal of Biomechanical Engineering*, **131**(1), 014502:1-6.

Conti S, Dazen D, Stewart G, Green A, Martin R, **Kuxhaus L**, Miller, MC. (2008) “Proprioception after total ankle arthroplasty.” *Foot and Ankle International*, **29**(11), 1069-1073.

Espirito M, **Kuxhaus L**, Kaufman RA, Li ZM, Goitz RJ. (2005) “Quantifying the effects of distal intrinsic release on digits’ proximal-interphalangeal joint flexion.” *Journal of Hand Surgery* **30A**(5), 1032-1038.

- Kuxhaus L**, Valero-Cuevas FJ, and Roach SS. (2005) “Quantifying deficits in the 3D force capabilities of a digit caused by selective paralysis: Application to the thumb with simulated low ulnar nerve palsy”, *Journal of Biomechanics*, **38**(4), 725-736.
- Li ZM, Fisk JA, **Kuxhaus L**, Christophel TH. (2004) “Coupling between wrist flexion-extension and radial-ulnar deviation”, *Clinical Biomechanics*, **20**(2), 177-183.

CONFERENCE PAPERS:

- Schimoler PJ, Viperman JS, **Kuxhaus L**, Flamm AM, Budny D, Baratz ME, Miller MC. “Control System for an Elbow Joint Motion Simulator” *IMECE 2007*.
- Kuxhaus L** and Grimmer MJ. (2001) “A Purge Solenoid Structure-borne Noise Model”. *2001 Noise and Vibration Proceedings*, SAE.

ABSTRACTS: (\*=PODIUM PRESENTATION; #=POSTER PRESENTATION)

- #Sonar AV, Issen KA, **Kuxhaus L**, Carroll JJ. “Simulation of subject-specific bone remodeling.” *ASB Annual Meeting*, Providence, RI; August 2010.
- Motlagh AS, Cook HA, Kim S, **Kuxhaus L**, Brogdon M, DeMeo PJ, #Miller MC. “The strain in the medial ulnar collateral ligament is localized in both the anterior and posterior bands of the anterior bundle.” *ASME Summer Bioengineering Conference*, Naples, FL; June 2010.
- #Schimoler PS, **Kuxhaus L**, Viperman JS, Miller MC. “Robotic controller design for an elbow simulator.” *2009 BMES Conference*, Pittsburgh, PA; October 2009.
- #**Kuxhaus L**, Brogdon M, Druschel M, Schimoler PJ, Marchessault JS, Baratz ME, Miller MC. “A method to quantify the influence of radial head fracture location on elbow kinematics.” *ASB Annual Meeting*, State College, PA; August 2009.
- \***Kuxhaus L**, Dazen D, Hofer A, Miller MC. “A comparison of two hip stem styles: subsidence, failure load, and bone density” *ASME Summer Bioengineering Conference*, Lake Tahoe, CA; June 2009.
- \*Brogdon ML, **Kuxhaus L**, DeMeo PJ, Schimoler PJ, Flamm A.M., Viperman JS, Miller MC. “Physiologic length of the UCL: at what flexion angle do the bands of the anterior bundle have zero strain?” *ICMMB Conference*, Pittsburgh, PA; July 2008.
- #**Kuxhaus L**, Thomines F, Flamm A.M., Schimoler PJ, Brogdon ML, Viperman JS, DeMeo PJ, Miller MC. “Measurement of elbow medial ulnar collateral ligament strain: choice of reference length reduces interspecimen variability.” *ASB Conference*, Ann Arbor, MI; August 2008.
- Schimoler PJ, Viperman JS, **Kuxhaus L**, Budny DD, Flamm AM, \*Miller MC. “Accuracy and precision of a control system for an elbow joint simulator.” *ASME Summer Bioengineering Conference*, Marco Island, FL; June 2008.
- #Miller MC, Thomines F, **Kuxhaus L**, Flamm AM, Schimoler PJ, Viperman JS, DeMeo PJ. “Tensile strain measurement of the bands of the medial ulnar collateral ligament.” *ORS annual meeting*, San Francisco, CA; February 2008.
- #Schimoler P, Viperman JS, **Kuxhaus L**, Budny DD, Flamm AM, Baratz ME, Miller MC. “Switching control to actuate elbow motion.” *American Society of Biomechanics Conference*, Stanford, CA; August 2007.
- \***Kuxhaus L**, Schimoler P, Flamm AM, Viperman JS, Baratz ME, Miller MC. “Moment arm measurement to validate a closed-loop feedback-controlled elbow joint simulator.” *American Society of Biomechanics Conference*, Stanford, CA; August 2007.
- \***Kuxhaus L**, Schimoler PJ, Viperman JS, Baratz ME, Miller MC. “Changes in camera visibility affect measured marker motion.” *ASME Summer Bioengineering Conference*, Keystone, CO; June 2007.
- \***Kuxhaus L**, Schimoler PJ, Viperman JS, Flamm AM, Budny D, Baratz ME, DeMeo PJ, Miller MC. “Measuring moment arms using closed-loop force control with an elbow simulator” *ASME Summer Bioengineering Conference*, Keystone, CO; June 2007.

- \***Kuxhaus L**, Schimoler PJ, Viperman JS, Miller MC. “Closed-loop control measurement of moment arms during pronation-supination in an elbow simulator.” *Northeast American Society of Biomechanics Conference*, Baltimore, MD March 2007.
- Martin C, \***Kuxhaus L**, Galik K, Flamm AM, Butler AL, Baratz ME, Miller MC. “A computer model to evaluate radial head translation.” *5<sup>th</sup> World Congress of Biomechanics*, Munich, Germany July 2006. Published in: *Journal of Biomechanics* (2006) **39**(S1) p. S47.
- Miller MC, Galik K, #**Kuxhaus L**, Butler A, Cohen MS, Baratz ME. “Transection of the annular ligament affects radial head travel but not the axis location in pronation-supination of the forearm.” *Orthopaedic Research Society*, Chicago, IL March, 2006.
- Miller MC, Galik K, #**Kuxhaus L**, Butler A, Cohen MS, Baratz ME. “Translation and travel of monoblock and bipolar radial head replacements during supination-pronation.” *Orthopaedic Research Society*, March, 2006.
- #**Kuxhaus L**, Viperman JS, Baratz ME, Magnusen JP, Miller MC. “Reproducing physiologic moment arms with an elbow simulator” *American Society of Biomechanics Conference*, Cleveland OH, August 2005.
- #**Kuxhaus L**, Harkness DA, Li ZM. “Directional force control of the thumb” *American Society of Biomechanics Conference*, Portland OR, September 2004.
- #**Kuxhaus L**, Fisk JA, Christophel TH, Li ZM. “Wrist position influences range of motion” *American Society of Biomechanics Conference*, Portland OR September, 2004.
- Espiritu MT, \***Kuxhaus L**, Kaufmann RA, Li ZM, Goitz RJ. “Quantifying PIP joint flexion improvement with distal intrinsic release” *Fifth Triennial International Hand and Wrist Biomechanics Symposium*, Syracuse, NY, September 7, 2004.
- \*Li ZM, Fisk JA, **Kuxhaus L**, Christophel TH. “Coupling between wrist flexion/extension and radial/ulnar deviation” *Fifth Triennial International Hand and Wrist Biomechanics Symposium*, Syracuse, NY, September 7, 2004.
- Kuxhaus L**, Valero-Cuevas FJ, and \*Roach SS. “Effect of simulated low ulnar nerve palsy on the 3D force production capabilities of the thumb”. *Fifth Triennial International Hand and Wrist Biomechanics Symposium*, Syracuse, NY, September 7, 2004.
- Espiritu MT, **Kuxhaus L**, Kaufmann RA, Li ZM, Goitz RJ. “Quantifying PIP joint flexion improvement with distal intrinsic release” *Pittsburgh Orthopaedic Journal*, volume 15, pp. 146-147, 2004.
- \***Kuxhaus L**, Valero-Cuevas FJ, and Roach SS. “Effect of Simulated Low Ulnar Nerve Palsy on the 3D Force Production Capabilities of the Thumb”. *Upstate Medical University Alumni Day*, Syracuse, NY, June, 2003.
- \***Kuxhaus L**, Valero-Cuevas FJ, and Roach SS. “Effect of simulated low ulnar nerve palsy on the 3D force production capabilities of the thumb”. *American Society of Biomechanics*, Toledo, OH, Sept., 2003.
- #**Kuxhaus L**, Pearlman JL, Weisman M, Valero-Cuevas FJ. “Predicting thumb force changes with ulnar nerve impairment”. *American Society of Biomechanics*, Toledo, OH, September, 2003.

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## PROFESSIONAL SERVICE

NSF GRADUATE RESEARCH FELLOWSHIP PROGRAM REVIEWER	2010-present
• Bioengineering 1 panel, February 2010.	
NIH GRANT REVIEW PANELS	2009-present
• Center for Scientific Review, Rehabilitation Sciences, November 2009.	
JOURNAL OF BIMOCHANICS	2010-present
• Ad-hoc reviewer.	
JOURNAL OF APPLIED BIMOCHANICS	2009-present
• Ad hoc reviewer.	
ASB CONFERENCE	2009, 2010
• Reviewed abstracts for consideration.	
ASME SUMMER BIOENGINEERING CONFERENCE	
• Design and Rehabilitation Committee member.	2007-present
○ Reviewed abstracts for annual meeting.	

- Co-chair of Orthopaedic Design session at 2009 meeting.
  - Education Committee member.
    - Organizing a workshop for the 2011 annual meeting.
    - Student poster competition judge, 2009.
- STUDENT MODERATOR, NORTHEAST ASB CONFERENCE March, 2007
- Co-chair of the Upper Extremity session with Dr. Margaret Finley.
- UNIVERSITY OF PITTSBURGH ENGINEERING WOMEN'S BREAKFASTS April 2005-May 2006
- Department representative to assist with organization.

#### **AWARDS AND HONORS:**

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- 2007 University of Pittsburgh Graduate and Professional Students' Association Travel Award.
- 2006 University of Pittsburgh Graduate and Professional Students' Association Travel Award.
- 2006 University of Pittsburgh School of Engineering Book Scholarship Award.
- 2006 University of Pittsburgh Provost's Development Fund Award.
- 2005 University of Pittsburgh Graduate and Professional Students' Association Travel Award.
- 2005 University of Pittsburgh IGERT Fellowship in assistive technology.
- 2004 American Society of Biomechanics Student Travel Award.
- 2004 University of Pittsburgh IGERT Fellowship in assistive technology.
- 2001 NSF Graduate Research Fellowship.
- 2001 GE Faculty of the Future Award.
- 2001 Honorable Mention, National Physical Sciences Consortium Fellowship Competition.

#### **PROFESSIONAL ASSOCIATIONS:**

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- American Society for Engineering Education (ASEE) -- December 2009-present.
- American Association of University Professors (AAUP) -- December 2009-present.
- American Association of University Women (AAUW) -- October 2009-present.
- American Society for Biomechanics (ASB) – July 2004-present.
- American Society of Mechanical Engineers (ASME), September 2002 - present.
- Biomedical Engineering Society (BMES), February 2001-present.
- Society of Automotive Engineers (SAE), September 2000-December 2008

#### **PROFESSIONAL EXPERIENCE:**

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POSTDOCTORAL RESEARCH ASSISTANT May 2008 - present

*Orthopaedic Biomechanics Laboratory, Allegheny General Hospital, Pittsburgh, PA*

- Assisted with laboratory management and orthopaedic research. Research projects included the analysis of the relationship between hip implant subsidence and bone density, a study of radial head fracture, and a study of medial ulnar collateral ligament strain.

GM POWERTRAIN INTERN May 2001-July 2001

*Noise and Vibration Labs and Shops Group, Milford, MI*

- Developed vibration profiles for accelerated durability tests of engine and chassis mounted components. Developed a sound-power based metric to rate hemianechoic chambers.

- GM POWERTRAIN INTERN May 2000-August 2000  
*Engine Noise and Vibration Group, Milford, MI*
- Studied bracket vibration transmissibility and purge solenoid noise.
- BIOMECHANICS EVALUATION LABORATORY January 2000-May 2000  
*Michigan State University, East Lansing, MI*
- Assisted with patient evaluations, mathematical analysis and interpretation of motion data.
- GM POWERTRAIN INTERN May 1999-August 1999  
*Transmission Noise and Vibration Group, Ypsilanti, MI*
- Used noise analysis software (LMS, Artemis and BAS) to create a masking noise portfolio and a demo tape for use in a design class.
- GM POWERTRAIN INTERN May 1998-August 1998  
*Rear Wheel Drive Design Group, Ypsilanti, MI*
- Created CAD (Unigraphics) drawings and models of transmission components.

### **COMMUNITY ACTIVITIES:**

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- Potsdam Community Band (Potsdam ,NY) September, 2009 - present
- Performing member; Leadership Team
- Northern Symphonic Winds (Potsdam ,NY) September, 2009 - present
- Performing member.
- Concert Band, St. Lawrence University (Canton ,NY) September, 2009 – April, 2010
- Performing member.
- Pittsburgh Symphony Orchestra *Soundbyte* Leadership Team March, 2008
- Participated in the planning and execution an event targeted to young professionals.
- Community Side-By-Side with the Pittsburgh Symphony June 15, 2004
- Participated in an event to foster a relationship among local avocational musicians.
- Pittsburgh Philharmonic (*formerly "North Pittsburgh Philharmonic"*) June 2004-August 2008
- Principal oboe, January 2005-August, 2008.
  - Board of Directors, February 2006-March 2008;
    - Recording Secretary, July 2006 – March 2008.
- Aeolian Winds of Pittsburgh August 2003-June, 2009
- Founding member, coordinator, graphic designer, webmaster, and assistant librarian.

### **REFERENCES:**

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Jeffrey S. Vipperman, Ph.D.  
 Director of Mechanical Engineering Graduate Studies  
 Associate Professor of Mechanical Engineering & Materials Science  
 University of Pittsburgh; 648 Benedum Hall  
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 Allegheny General Hospital  
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Mark E. Baratz, M.D.  
Vice Chairman, Allegheny General Hospital Department of Orthopaedic Surgery  
Division Director, Allegheny General Hospital of Upper Extremity Surgery  
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Mark S. Redfern, Ph.D.  
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