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Curriculum Vitae

Trevor J. Lujan, Ph.D.

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PERSONAL

Date of Birth: May 22, 1975. Minneapolis, Minnesota.
Spouse: Tenneal E. Lujan, married June 22, 2002.
Daughter: Cecilia M. Lujan, born Feb. 25, 2009

EDUCATION

Dec. 2007 Ph.D., Bioengineering
University of Utah, Salt Lake City
May 1998 B.S., Mechanical Engineering
University of Wisconsin, Madison
May 1998 Technical Communications Certificate
University of Wisconsin, Madison

PROFESSIONAL / ACADEMIC / TEACHING

1/2012 – present Assistant Professor
Mechanical and Biomedical Engineering
Boise State University, Idaho
5/2012 – present Director
Northwest Tissue Mechanics Laboratory
Boise State University, Idaho
11/2010 – 12/2011 Assistant Scientist
Biomechanics Laboratory
Legacy Research, Oregon

8/2010 – 12/2011	Adjunct Assistant Professor Mechanical Engineering University of Portland, Oregon
10/2007 – 10/2010	Research Associate Biomechanics Laboratory Legacy Research, Oregon
8/2005 – 8/2006	Chair Graduate Student Advisory Committee, Bioengineering University of Utah, Utah
8/2002 – 8/2005	Council Member Graduate Student Advisory Committee, Bioengineering University of Utah, Utah
8/2003 – 8/2007	Project Engineer BioAid Consulting Salt Lake City, Utah
8/2002 – 9/2007	Research Assistant Bioengineering University of Utah, Utah
9/2001 – 7/2002	Research Assistant Mechanical Engineering University of Canterbury, New Zealand
9/1998 – 7/2000	Technical Analyst Accenture (formerly Andersen Consulting) San Francisco, CA
1/1998 – 5/1998	Technical Writer Power Engine Industry Consultants Madison, WI
5/1997 – 9/1997	Engineering Intern St. Jude Medical St. Paul, MN
5/1996 – 8/1996	Engineering Intern VA Hospital, Bioengineering Madison, WI

Teaching

Fall 2012	Instructor, Biomaterials (ME477, MSE477) Mechanical and Biomedical Engineering, Boise State Univ.
Spring 2012	Instructor, Continuum Mechanics (ME510) Mechanical and Biomedical Engineering, Boise State Univ.
Spring 2011	Guest Lecturer (Constitutive Models), Biomechanics Mechanical Engineering, University of Portland
Fall 2010	Instructor, Biomaterials Science (ME491) Mechanical Engineering, University of Portland
Spring 2010	Guest Lecturer (Constitutive Models), Biomechanics Mechanical Engineering, University of Portland
Spring 2007	Guest Lecturer (Poroelasticity), Biosolids (BIOEN 7210) Bioengineering, University of Utah
Fall 2005	Teaching Assistant, Biomechanics (BIOEN 5201, 6201), Department of Bioengineering, University of Utah
Spring 2000	Instructor, Introduction to C Programming Accenture, San Francisco, CA
Spring 1998	Assistant for science outreach at elementary schools University of Wisconsin - Madison

Graduate Students – Current

Christina Sundgren 2012- (B.S., Mechanical Eng., Boise State, EGD 2014)

Undergraduate Students – Current

Evan Rust 2012- (B.S., Mechanical Eng., Boise State, EGD 2014)

Ashley Madsen 2012- (B.S., Mechanical Eng., Boise State, EGD 2014)

Undergraduate Students – Alumni

Susanna Cai 2011 (B.S., Mechanical Eng., Duke Univ., EGD 2015)

Kevin Burfeind 2009-2011 (B.S., Exercise Science, Willamette Univ., 2011)

Kyle Wirtz 2008-2010 (B.S., Mechanical Eng, Portland State Univ)

Josiah Brown 2010 (B.S., Mechanical Eng., Duke Univ., EGD 2013)

Meghan O'Donovan 2008 (B.S., Mechanical Engineering, U. of Rochester 2009)

Nathan Jacobs	2006-2007 (B.S., Biomedical Engineering, U. of Utah, 2007)
Brent Thompson	2003-2006 (B.S., Biomedical Engineering, U. of Utah, 2006)
Tim Plazier	2003-2004 (B.S., Electrical Engineering, U. of Utah, 2006)
Spencer Lake	2002-2003 (B.S., Biomedical Engineering, U. of Utah, 2006)
Michael Small	2001-2003 (B.S., Chemistry, U. of Utah, 2006)

HONORS AND AWARDS

Award of Excellence from Academy of Orthopaedic Surgeons – 2010 (Author)
 Mid America Award – Best Paper – 2010 (Author)
 Provost’s Honor list at U. of Utah – All semesters enrolled, Fall 2002 to Spring 2007
 Provost’s Honor list at U. of Wisconsin – All semesters enrolled, Fall 1993 to Spring 1998
 Runner-up, Bioengineering graduate student poster competition – 2004, U. of Utah
 Team member on national champion hybrid car team – 1997/98, U. of Wisconsin
 Team lead on award winning engineering EXPO exhibit – 1996/97, U. of Wisconsin
 Rogers Design Scholarship – 1996/97 Academic Year, U. of Wisconsin
 Elliot Scholarship – 1995/96 Academic Year, U. of Wisconsin

INVITED SPEAKER

Material Science and Engineering Seminar, “A Novel Mechatronic System to Advance Cartilage Tissue Engineering”, Boise State University, Boise, Sept. 2011.

Osteosynthesis & Trauma Care Foundation Workshop. “Periosteal Callus Quantification from Plain Radiographs”, Barcelona, Spain, Oct. 2011.

Legacy Research Institute Seminar, “Advancing Orthopaedic Surgery using Principles of Mechanobiology”, Portland, OR, Sept. 2011.

SERVICE

Review and Editorial Duties

Reviewer, Journal of Biomechanics
 Reviewer, Journal of Bone and Joint Surgery
 Reviewer, Connective Tissue Research
 Reviewer, Injury
 Reviewer, Journal of Applied Biomechanics
 Reviewer, Tissue Engineering

Organization and Chairing at Scientific Meetings

Reviewer, ASME SBC (Student Paper Competition, June, 2011)
 Reviewer, ASME SBC (Student Paper Competition, June, 2012)

Committee Membership

Member, College of Engineering Safety Committee, Boise State, ’12-13’
 Member, MBE Faculty Search Committee, Boise State ’12-13’

Chair, Biomedical Committee, Mechanical & Biomedical, Boise State '12-13'
Member, Graduate Committee, Mechanical & Biomedical, Boise State, '12-13'
Chair, Graduate Student Advisory Committee, Bioengineering, U. Utah, '06-07'
Member, Graduate Student Advisory Committee, Bioengineering, U. Utah, '02-06'

SOCIETIES

American Society of Engineering Education, Since 2012
Orthopaedic Research Society, since 2008
Biomedical Engineering Society, since 2005

PUBLICATIONS

Thesis/Dissertation

Lujan TJ: Multiscale Relationships in Ligament Mechanics. PhD Dissertation, University of Utah, Dec. 2007. (http://mrl.sci.utah.edu/papers/lujan_dissertation_final.pdf)

Refereed Journal Articles (* = corresponding author)

1. **Lujan TJ**, Lake SP, Plaizier TA, Ellis BJ, *Weiss JA: Simultaneous measurement of three-dimensional joint kinematics and tissue strains with optical methods. *ASME Journal of Biomechanical Engineering*, 127:193-197, 2005.
2. *Weiss JA, Gardiner JC, Ellis BJ, **Lujan TJ**, Phatak NS: Three-dimensional finite element modeling of ligaments: Technical aspects. *Medical Engineering and Physics* 27(10):845-61, 2005.
3. Ellis BJ, **Lujan TJ**, Dalton MS, *Weiss JA: MCL insertion site and contact forces in the ACL-Deficient knee. *Journal of Orthopaedic Research* 24(4):800-810, 2006.
4. **Lujan TJ**, Underwood CJ, Henninger HB, Thompson BM, *Weiss JA: Effect of dermatan sulfate glycosaminoglycans on the quasi-static material properties of the human medial collateral ligament. *Journal of Orthopaedic Research* 25(7):894-903, 2007.
5. **Lujan TJ**, Dalton MS, Thompson BM, Ellis BJ, *Weiss JA: Effect of ACL Deficiency on MCL strains and joint kinematics. *Journal of Biomechanical Engineering* 129(3):386-92, 2007.
6. **Lujan TJ**, Underwood CJ, Jacobs N, *Weiss JA: Contribution of glycosaminoglycans to viscoelastic tensile behavior of human ligament. *Journal of Applied Physiology* 106(2): 423-31, 2009.
7. **Lujan TJ**, Henderson CE, Madey SM, Fitzpatrick DC, Marsh JL, *Bottlang M: Locked Plating of Distal Femur Fractures Leads to Inconsistent and Asymmetrical Callus Formation: *Journal of Orthopaedic Trauma*, 24(3):156-62, 2010.
8. ***Lujan TJ**, Madey SM, Fitzpatrick DC, Byrd GD, Sanderson JM, Bottlang M: A Computational Technique to Measure Fracture Callus in Radiographs. *Journal of Biomechanics*, 43(4):792-5, 2010.

9. Henderson CE, **Lujan TJ**, Bottlang M, Fitzpatrick DC, *Marsh JL: Stabilization of distal femur fractures with IM nails and locking plates: differences in callus formation. *Iowa Orthopaedic Journal*, 30:61-8, 2010.
10. *Bottlang M., Doornink J, **Lujan TJ**, Fitzpatrick DC, Marsh JL, Augat P, Rechenberg B, Lesser M, Madey SM. Effects of Construct Stiffness on Healing of Fractures Stabilized with Locking Plates. *Journal of Bone and Joint Surgery (Am)*, Dec; 92 Suppl 2:12-22, 2010.
11. ***Lujan TJ**, Wirtz, Madey SM, Bottlang M. A novel bioreactor for the dynamic stimulation and mechanical evaluation of multiple tissue engineered constructs. *Tissue Engineering Part C Methods*. 2011 Mar;17(3):367-74
12. Henderson CE, **Lujan TJ**, Bottlang M, Fitzpatrick DC, *Marsh JL: Healing of Distal Femur Fractures Treated with Locked Plates. Accepted Nov. 2010, *Clinical Orthopaedics and Related Research*. 2011 Jun;469(6):1757-65. Epub 2011 Mar 22.
13. Bahney CS, **Lujan TJ**, Hsu CW, Bottlang M, West JL, *Johnstone B. Visible light photoinitiation of mesenchymal stem cell-laden bioresponsive hydrogels. *European Cells and Matrix*. 2011 Jul 15;22:43-55.
14. *Bottlang M., Doornink J, **Lujan TJ**, Fitzpatrick DC, Madey SM. Biomechanics and Use of Far Cortical Locking in Orthopaedic Trauma. *Orthopaedic Knowledge Online*. In Press.

Conference Proceedings

- Lujan TJ**, Dalton MS, Lake SP, Ellis BJ, Rosenberg TD, Weiss, JA: ACL injury alters MCL strain during anterior-posterior but not varus-valgus loading. *Proc 50th Annual Orthopaedic Research Society Meeting*, 29:1272, 2004 (Poster).
- Dalton MS, Ellis BJ, **Lujan TJ**, Weiss JA: MCL insertion site and contact forces in the ACL-deficient knee. *Proc 51st Annual Orthopaedic Research Society Meeting*, 30:814, 2005.
- Ellis BJ, Dalton MS, **Lujan TJ**, Weiss JA: Subject-specific finite element modeling of MCL mechanics in the ACL-deficient knee. *Proc ASME Summer Bioengineering Conference*, June 2005 (Podium).
- Henninger HJ, Underwood CJ, **Lujan TJ**, Weiss JA: Decorin proteoglycans do not resist shear deformation in ligament. *Biomedical Engineering Society Conference Annual Meeting*, October 2005 (Poster).
- Lujan TJ**, Thompson BM, Ellis BJ, Weiss JA: Effect of ACL transection on MCL strains during anterior tibial translation and valgus rotation. *1st Annual Mountain West Biomedical Engineering Conference*, August 2005 (Poster).
- Lujan TJ**, Underwood CJ, Henninger HB, Weiss JA: Dermatan Sulfate glycosaminoglycans do not contribute to the shear or tensile material behavior of the human MCL. *52nd Annual Meeting of the Orthopaedic Research Society*, February 2006.
- Underwood CJ, Henninger HB, **Lujan TJ**, Weiss JA: Glycosaminoglycan concentration and species in human knee ligaments. *52nd Annual Meeting of the Orthopaedic Research Society*, February 2006 (Poster).
- Henninger HB, **Lujan TJ**, Underwood CJ, *Weiss JA: Distribution and mechanical implications of dermatan sulfate in human medial collateral ligament. *ASME Summer Bioengineering Conference*, June 2006 (Poster).

- Lujan TJ**, Ellis BJ, Thompson BM, Weiss JA: MCL Mechanics in the ACL-Deficient Knee. An experimental and finite element based study. 5th World Congress of Biomechanics, August 2006 (Podium).
- Underwood CJ, **Lujan TJ**, Henninger HB, Weiss JA: The Distribution and Influence of Dermatan Sulfate in Ligament Biomechanics. 5th World Congress of Biomechanics, August 2006 (Podium).
- Underwood CJ, **Lujan TJ**, Thompson BM, Henninger HJ, Weiss JA: Influence of sulfated glycosaminoglycans on mechanics of the MCL. Biomedical Engineering Society Conference Annual Meeting, October 2005 (Podium).
- Lujan TJ**, Underwood CJ, Jacobs NT, Weiss JA: Tissue swelling during extended material testing of ligaments. ASME 2007 Summer Bioengineering Conference, June 2007 (Poster).
- Lujan TJ**, Underwood CJ, Jacobs NT, Weiss JA: Contribution of glycosaminoglycans to the viscoelastic tensile behavior of human ligament. 54th Annual Meeting of the Orthopaedic Research Society, February 2008 (Podium).
- Lujan TJ**, Henderson CE, O'Donovan M, Madey SM, Fitzpatrick DC, Bottlang M: Automated measurement of callus formation. ASME Summer Bioengineering Conference, June 2009 (Poster).
- Bottlang M, **Lujan TJ**, Phelan D, Henderson CE, Marsh JL, Fitzpatrick DC, Madey SM: Stabilization of distal femur fractures with IM nails and locking plates: differences in callus formation. Orthopaedic Trauma Association, January 2010 (Poster).
- Bottlang M, Doornink J, **Lujan TJ**, Fitzpatrick D, Madey: Far-cortical locking of distal femur fractures. Accepted, American Academy of Orthopaedic Surgeons, February 2010 (Scientific Exhibit).
- Lujan TJ**, Henderson CE, Madey SM, Fitzpatrick DC, Marsh JL, Bottlang M: Factors that Influence Callus Formation in Locked Plating of Distal Femur Fractures. Academy of Orthopaedic Surgeons, February 2010 (Poster).
- Henderson CE, **Lujan TJ**, Fitzpatrick DC, Bottlang M, Marsh JL: Lack of Callus Predicts Nonunion After Locking Plate for Distal Femur Fractures: Are Locking Plates Too Stiff. Mid America Orthopaedic Association, April 2010 (Podium).
- Doornink J, Madey SM, Fitzpatrick DC, **Lujan TJ**, Bottlang M: Analysis of periosteal callus formation in locked plating of distal femur fractures. 56th Annual Meeting of the Orthopaedic Research Society, March 2010 (Poster).
- Lujan TJ**, Wirtz K, Madey SM, Bottlang M: A bioreactor to mechanically stimulate and evaluate tissue-engineered constructs during culture. Biomedical Engineering Society Conference Annual Meeting, May 2010 (Poster).
- Lujan TJ**, Wirtz K, Madey SM, Bottlang M: High-Throughput Mechanical Evaluation of Tissue Engineered Constructs During Incubation. Accepted, 2011 Annual Meeting of the Orthopaedic Research Society, Jan. 2011 (Podium).

GRANTS

Current, Extramural

Organization: National Institutes of Health, NINDS, R41

Title: Advanced Bicycle Helmet Technology for Prevention of Traumatic Brain Injury

Amount: \$144,000 total costs

Role: co-investigator

Dates: 5/1/11 – 5/1/12

Synopsis: The overall goal of this grant is to conduct a feasibility study on an advanced impact mitigation system that absorbs rotational energy to reduce the rotational accelerations that cause traumatic brain injury.

Organization: National Institutes of Health, NIAMS, R42

Title: A cost-effective bioreactor to advance functional tissue engineering of cartilage

Amount: \$595,000 total costs (2 years)

Role: PI

Dates: 5/1/12 - 4/30/14

Synopsis: This phase II grant will expand the bioreactor technology that was developed in the phase I proposal (submitted Aug. 5, 2011)

Organization: Higher Education Research Council of Idaho

Title: A computational method to advance the clinical treatment of bone fractures

Amount: \$27,000 total costs (1 year)

Role: PI

Dates: 9/1/12 - 8/30/13

Synopsis: This incubation grant will build upon public knowledge to measure radiographic features of interest in bone fractures.

Planned

Organization: National Institutes of Health, NCCAM, R01

Title: Mechanobiology of Ligament Repair

Role: PI

Planned Submission: 10/1/2011

Synopsis: This research grant will investigate the role of mechanical loading in ligament repair and remodeling. Study objectives include determining mechanical thresholds for functional healing and validating a remodeling algorithm to predict tissue regeneration.

Organization: National Institutes of Health, NIAMS, R21

Title: A computational method to quantify fracture healing from computed tomography.

Role: PI

Planned Submission: 2/16/2012 (projected)

Synopsis: This exploratory grant will develop a computational framework for measuring features in CT scans that indicate fracture union.

Past, Extramural

Organization: Zimmer Orthopaedic

Title: Clinical Trial for MotionLoc Screws

Amount: \$189,000 total costs

Role: co-investigator

Dates: 5/1/11 – 5/1/12

Synopsis: This 33 patient prospective study assesses the health benefit of MotionLoc screws through imaging (radiographs and CT) and patient follow-up.

Organization: National Institutes of Health, NIAMS, 1R41AR059433-01.

Title: A cost-effective bioreactor to advance functional tissue engineering of cartilage

Amount: \$100,175 total costs

Role: PI

Dates: 5/1/10 – 5/1/11

Synopsis: The aim of this grant is to perform a feasibility study on a bioreactor that can facilitate the rapid discovery of biophysical and biochemical conditions that promote the synthesis of mechanically viable tissue.

Organization: Medical Research Foundation of Oregon (seed grant)

Title: Mapping the Functional Development of Engineered Cartilage: Establishing a Methodology.

Amount: \$40,000

Role: PI

Dates: 5/31/08 - 5/31/10

Description: The aim of this study was to develop a methodology to map the mechanical development of engineered cartilage during culture. Results from this study have led to a published manuscript and preliminary data for a funded STTR grant.

Organization: Legacy Research Advisory Committee (seed grant)

Title: Objective Assessment of Fracture Healing using Digital Radiographs

Amount: \$20,000

Role: PI

Dates: 6/01/08 - 6/01/09

Synopsis: This research produced a computational method to objectively measure radiographic features that correlate to fracture healing. This method was published and utilized by four subsequent clinical studies.

Organization: National Institutes of Health (NIAMS #2R01AR047369-05)

Title: Origins of Elasticity and Viscoelasticity in Knee Ligaments

Amount: \$800,000 total direct costs

Role: Funded student. Assisted writing preliminary data section of grant. PI - JA Weiss

Dates: 9/1/04 - 8/31/09

Organization: National Institutes of Health (NIAMS), #R01-AR47369-01

Title: Mechanics of the MCL in Normal and ACL-Deficient Knees

Amount: \$425,000 total direct costs

Role: Funded student. PI - JA Weiss

Dates: 9/1/2000 - 8/31/2004

TECHNICAL SKILLS

Proficient	C, C++, SQLPLUS, JavaScript, DHTML, Informatica, Visual Basic, SigmaStat, SPSS, Matlab, LabVIEW, Maple, DMAS, MS Access, MS Project, Project Workbench, Truegrid, LSPost, NIKE3D, FEBio and UNIX.
Skilled	Amira, ANSYS, Truegrid, DOS, ASP, SQL, SQL Server, ACAD, SolidWorks, and Oracle

OVERSEAS TRAVEL

8/2004 - 1/2005	Studied Spanish and traveled throughout South America.
8/2000 - 8/2002	Traveled, worked and lived in Southeast Asia, Australia and New Zealand.
9/1997 - 12/1997	Independent semester abroad in Western Europe.