



## **SAMUEL ROBINSON, Ph.D.**

### PROFESSIONAL BIOGRAPHICAL OUTLINE

#### **BACKGROUND**

Dr. Robinson is a Senior Biomechanist at ARCCA specializing in forensic analysis of injuries and biomechanics. He holds a Bachelor of Science in Mechanical Engineering from the University of California at Berkeley, during which he took elective courses in orthopedic biomechanics and biomaterials, and interned at the major medical device company Medtronic. After obtaining his undergraduate degree, he joined the Spine Biomechanics Laboratory at Cedars Sinai Medical Center in Los Angeles. As a Research Associate, he executed and developed test protocols for evaluating mechanical properties of cadaveric and rodent spinal segments to assess the efficacy of various surgical interventions. He then enrolled in the Biomedical Engineering department at Columbia University, where he joined the Bone Bioengineering Lab. Through the course of earning his Ph.D., he independently planned and executed studies in the field of bone mechanobiology, exploring mechanisms by which bones sense and respond to mechanical stimuli. Beyond experimental work, Dr. Robinson served as a mentor to undergraduate and Master's level research associates, was a Teaching Assistant for Solid Mechanics and Fluid Mechanics courses, coauthored a textbook chapter, and helped write NIH R01 grants.

#### **SUMMARY OF EXPERIENCE**

- Comprehensive, cogent, and concise analysis and presentation of data
- Critical evaluation of scientific (specifically biomedical) literature
- Performance and interpretation of mechanical testing using various modes and materials
- Succinct communication of technical findings to a broad audience

#### **AREAS OF EXPERTISE**

- Human Injury Biomechanics and Tolerance
- Vehicular Accident Reconstruction
- Injury Mechanism and Mitigation Analysis
- Impact and Inertial Trauma Analysis
- Slip/Trip/Fall Analysis

#### **EDUCATION**

- Doctor of Philosophy in Biomedical Engineering, Columbia University, May 2020
- Master of Philosophy in Biomedical Engineering, Columbia University, May 2017
- Master of Science in Biomedical Engineering, Columbia University, May 2015
- Bachelor of Science in Mechanical Engineering, University of California at Berkeley, May 2011

## PROFESSIONAL EXPERIENCE

### June 2020 – Present | ARCCA, Incorporated | Senior Biomechanist

- Specializes in injury analysis, injury mechanism determination, and accident reconstruction
- Practices detail-oriented inspections using sound investigative techniques and evidence documentation
- Executes comprehensive analyses frequently incorporating medical records, empirical testing, literature review, and computational modeling to assess accident severity and injury potential
- Drafts reports that succinctly correlate events with claimed injuries based on scientific analyses and contextualized within published technical literature

### 2013 – 2020 | Bone Bioengineering Laboratory, Department of Biomedical Engineering, Columbia University | Doctoral Thesis Research

Thesis Title: *Bone Mechanobiology of Modeling and Remodeling and the Effect of Hematopoietic Lineage Cells*

- Designed & manufactured attachments to load frame for stimulatory loading of live mouse tibiae
- Independently carried out longitudinal studies in mice requiring loading, injections, imaging, etc.
- Wrote 4 animal experimentation protocols approved by Institutional Animal Care and Use Committee
- Bred and maintained colonies of >10 variants of transgenic mice
- Developed novel high-resolution computed tomography image analysis algorithms to track bone metrics over time
- Wrote code to correlate data from image analysis algorithms with finite-element modeling data
- Described new bone morphological metric which improved existing predictions of strength/stiffness
- Coauthored a NIH R01 proposal (& yearly renewals) ranked in the top 5% of submissions
- Mentored >5 high school through Master's level students in related research projects

### 2011 – 2013 | Spine Biomechanics Laboratory, Department of Surgery, Cedars-Sinai Medical Center | Research Associate

- Developed, tested, & executed novel biomechanical testing method for evaluation of spinal fusion in a rodent model that has since been cited and used by other research laboratories
- Designed custom loading fixtures to modify machinery for multiple unique cadaver spine biomechanics studies
- Assembled data collection systems to simultaneously monitor range of motion (optically), disc pressure, facet joint forces, and multiaxial stiffnesses of cadaver spines to assess biomechanical differences of various fusion constructs

## 2010 | Medtronic Diabetes | Mechanical Engineering Intern

- Designed proposed sensor housing/connection components in electrochemical glucose sensor research and development group

## ADDITIONAL EXPERIENCE

- Graduate Teaching Assistant, Solid Biomechanics, Columbia University, Spring 2014
- Graduate Teaching Assistant, Fluid Biomechanics, Columbia University, Spring 2015
  - Gave weekly one-hour lectures reviewing material and working through example problems

## AWARDS RECEIVED

- 3x Annual Meeting Young Investigator Travel Grant Recipient, American Society for Bone & Mineral Research (2017, 2018, 2019)
- Young Investigator Award, 22<sup>nd</sup> International Workshop on Quantitative Musculoskeletal Imaging (2019)
- Best Research Poster (Coauthor), Columbia Engineering in Medicine Symposium (2018)
- Most Outstanding Basic Abstract Award (Coauthor), American Society for Bone & Mineral Research (2016)

## CONFERENCE PRESENTATIONS GIVEN

### Oral

**Robinson ST** and Guo XE. *Trabecular-Cortical Interface Surface Area Metric (iSAM): an Intuitive & Novel Whole Bone Morphological Parameter That Strongly Correlates with Finite Element Predicted Stiffness of Clinical HR-pQCT Scans*. American Society of Bone and Mineral Research Annual Meeting, Sept. 21-24, 2019. Orlando, FL.

**Robinson ST**, Hu Y, Guo XE. *Quantifying (Re)modeling Over 5 Weeks of Mechanical Loading Using Time-Lapse In Vivo Micro-Computed Tomography*. 22<sup>nd</sup> International Workshop on Quantitative Musculoskeletal Imaging. Feb. 24-Mar. 1, 2019. Lake Louise, Alberta, CAN.

**Robinson ST**, Hu Y, and Guo XE. *Unique Principal Strain Environments Favor Different Trabecular Bone (Re)modeling Events As Determined By Sequential microCT and Finite Element Modeling In Vivo*. Orthopaedic Research Society Annual Meeting. Feb. 1-5, 2019. Austin, TX.

**Robinson ST**, Hu Y, Guo XE. *In Vivo Dynamic Bone Formation and Resorption Under Combined PTH and Mechanical Loading*. Orthopaedic Research Society Annual Meeting. Mar. 19-22, 2017. San Diego, CA.

Metzger MF, **Robinson ST**, Drazin D, Svet MT, Acosta FL. *Biomechanical Analysis of the Proximal Adjacent Segment after Scoliosis Correction: Do Hooks Ease the Transition?* 20<sup>th</sup> International Meeting on Advanced Spine Techniques. Jul. 10-13, 2013. Vancouver, BC, CAN.

**Robinson ST**, Delamarter RB, Svet MT, Metzger MF. *Does Sacral Geometry Affect Biomechanical Behavior and Facet Forces after Total Disc Replacement at the Lumbosacral Junction?* Annual Meeting of the International Society for the Advancement of Spine Surgery. Apr. 3-5, 2013. Vancouver, BC, CAN.

## **Selected Posters**

**Robinson ST**, Hu Y, Guo XE. *Diverging Periosteal and Endosteal Modeling/Remodeling Under PTH and Mechanical Loading*. American Society of Bone and Mineral Research Annual Meeting, Sept. 7-12, 2017. Denver, CO.

**Robinson ST**, Zhou B, Guo XE. *Trabecular-Cortical Interface Surface Area Metric (iSAM) Measured From Clinical HR-pQCT Scans Correlates Strongly With Experimentally-Determined Whole Bone Segment Stiffness*. Orthopaedic Research Society Annual Meeting, Feb. 8-11, 2020. Phoenix, AZ.

**Robinson ST**, Hu Y, Guo XE. *Diverging Periosteal and Endosteal Modeling/Remodeling Under PTH and Mechanical Loading*. American Society of Bone and Mineral Research Annual Meeting, Sept. 7-12, 2017. Denver, CO.

## **SELECTED PUBLICATIONS**

**Robinson ST**, Shyu PT, Guo XE. Mechanical Loading and Parathyroid Hormone Effects and Synergism in Bone Vary by Site and Modeling/Remodeling Regime. *Bone*, Accepted and In Preparation.

Morrell AE, **Robinson ST**, Ke HZ, Holdsworth G, Guo XE. Osteocyte Mecahnosensing Following Short-term and Long-term Treatment with Sclerostin Antibody. *Bone*, 2021.

Morrell AE, **Robinson ST**, Silva MJ, Guo XE. Mechanosensitive Ca<sup>2+</sup> Signaling and Coordination is Diminished in Osteocytes of Aged Mice During *Ex Vivo* Tibial Loading. *Connective Tissue Research*, 2020.

Morrell AE, Brown GN, **Robinson ST**, Sattler RL, Baik AD, Zhen G, Cao X, Bonewald LF, Jin W, Kam LC, Guo XE. Mechanically Induced Ca<sup>2+</sup> Oscillations in Osteocytes Release Extracellular Vesicles and Enhance Bone Formation. *Bone Research*, 2018.

Villasante A, Marturano-Kruik A, **Robinson ST**, Liu Z, Guo XE, Vunjak-Novakovic G. Tissue-Engineered Model of Human Osteolytic Bone Tumor. *Tissue Engineering*, 2017.

Ortuño MJ, **Robinson ST**, Subramanyam P, Huang Y, Guo XE, Colecraft HM, Mann JJ, Ducey P. Serotonin-reuptake Inhibitors Act Centrally to Cause Bone Loss in Mice by Counteracting a Local Anti-resorptive Effect. *Nature Medicine*, 2016.

**Robinson ST**, Svet MT, Kanim LA, Metzger MF. Four-Point Bending as a Method for Quantitatively Evaluating Spinal Arthrodesis in a Rat Model. *Comparative Medicine*, 2015.

Metzger MF, **Robinson ST**, Svet MT, Liu JC, Acosta FL. Biomechanical Analysis of the Proximal Adjacent Segment after Multilevel Instrumentation of the Thoracic Spine: Do Hooks Ease the Transition? *Global Spine Journal*, 2015.

Metzger MF, Kanim LA, Zhao L, **Robinson ST**, Delamarter RB. The Relationship between Vitamin D Status and Successful Spinal Fusion. *The Spine Journal*, 2013.