

ALEX KHANG

Boulder, Colorado
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EDUCATION

Doctor of Philosophy in Biomedical Engineering

August 2016 – May 2022

The University of Texas at Austin (UT-Austin)
Department of Biomedical Engineering
The Oden Institute for Computational Engineering and Sciences

Master of Science in Biomedical Engineering

August 2016 – December 2018

The University of Texas at Austin (UT-Austin) Overall GPA: 3.75

Bachelor of Science in Biomedical Engineering

August 2012 – July 2016

University of Arkansas – Fayetteville (U of A) Overall GPA: 3.97

RESEARCH EXPERIENCE

Post-doctoral Researcher, University of Colorado Boulder (August 2022 – Present)

Advisor: Dr. Kristi Anseth.

Graduate Research Assistant, UT-Austin (August 2016 – June 2022)

Thesis: “On the 3D contractile properties of the aortic heart valve interstitial cell in health and disease”.

Advisor: Dr. Michael S. Sacks

Undergraduate Research Assistant, U of A (May 2014 – August 2016)

Project: Fabricated nanofibrous scaffolds for tissue engineering applications using a novel technique called centrifugal jet spinning.

Advisor: Dr. Kartik Balachandran

PUBLICATIONS

Original Research Articles

1. **Khang A**, Meyer K, Sacks MS. An inverse modeling approach to estimate 3D aortic valve interstitial cell stress fiber force levels. *Journal of Biomechanical Engineering*. *Under review*. 2023.
2. Nelson BR, Kirkpatrick BE, Miksch CE, Davidson MD, Skillin NP, Hach GK, **Khang A**, Hummel SN, Fairbanks BD, Burdick JA, Bowman CN, Anseth KS. Photoinduced Dithiolane Crosslinking for Multiresponsive Dynamic Hydrogels. *Advanced Materials*: 2211209. 2023.
3. **Khang A**, Steinman J, Tuscher R, Feng X, Sacks MS. Estimation of aortic valve interstitial cell-induced 3D remodeling of poly(ethylene glycol) hydrogel environments using an inverse finite element approach. *Acta Biomaterialia* (160): 123-133 2023.
4. **Khang A**, Nguyen Q, Feng X, Howsmon DP, Sacks MS. Three-dimensional analysis of aortic valve interstitial cell shape and its relation to contractile behavior. *Acta Biomaterialia* (163): 194-209 2023.
5. **Khang A**¹ **Lejeune E**¹, Abbaspour A, Howsmon DP, Sacks MS. On the 3D correlation between myofibroblast shape and contraction. *Journal of Biomechanical Engineering* 143(9): 094503. 2021.
6. Lejeune E, **Khang A**, Sansom J, Sacks MS. FM-Track: A fiducial marker tracking software for studying cell mechanics in a three-dimensional environment. *SoftwareX* (11): 100417. 2020.

7. **Khang A**, Rodriguez Gonzalez A, Schroeder ME, Sansom J, Lejeune E, Anseth KS, Sacks MS. Quantifying Heart Valve Interstitial Cell Contractile State Using Highly Tunable Poly (Ethylene Glycol) Hydrogels. *Acta Biomaterialia* (96): 354-367. 2019.
8. **Ravishankar P¹**, **Khang A¹**, Laredo M, Balachandran K. Using Dimensionless Numbers to Predict Centrifugal Jet-Spun Nanofiber Morphology. *Journal of Nanomaterials* (2019): 1-14. 2019.
9. **Khang A**, Ravishankar P, Krishnaswamy A, Anderson PK, Cone SG, Liu Z, Qian X, Balachandran K. Engineering anisotropic biphasic Janus-type polymer nanofiber scaffold networks via centrifugal jet spinning. *J Biomed Mater Res Part B* (105): 2455-2464. 2016.

Book Chapters

1. **Khang A**, Howsmon DP, Lejeune E, Sacks, MS. Multi-scale modeling of the heart valve interstitial cell. *Multi-Scale Extracellular Matrix Mechanics and Mechanobiology*: 21-53. 2019.
2. **Khang A**, Buchanan RM, Ayoub, S, Rego BV, Lee CH, Sacks MS. Biological Mechanics of the Heart Valve Interstitial Cell. *Advances in Heart Valve Biomechanics*: 3-36. 2018.
3. **Khang A**, Buchanan RM, Ayoub S, Rego BV, Lee CH, Ferrari G, Anseth KS, Sacks MS. Mechanobiology of the Heart Valve Interstitial Cell: Simulation, Experiment, Discovery. *Mechanobiology in health and disease* (1): 249-283. 2018.

CONFERENCE PROCEEDINGS

Oral Presentations

1. **Alex Khang**, John Steinman, Xinzeng Feng, Michael S. Sacks, "Modeling the three-dimensional contractile behaviors of the aortic heart valve interstitial cell within a hydrogel medium," 9th World Congress of Biomechanics, July 2022, Taipei, Taiwan.
2. **Alex Khang**, John Steinman, Xinzeng Feng, Michael S. Sacks, "A Fully 3D Computational Contractile Model of the Aortic Valve Interstitial Cell," 19th U.S. National Congress on Theoretical and Applied Mechanics, June 2022, Austin, TX, USA.
3. **Alex Khang**, John Steinman, Xinzeng Feng, Michael S. Sacks, "A 3D Computational Model of Aortic Valve Interstitial Cell Contractile Behavior Within a PEG Hydrogel Medium," Summer Biomechanics, Bioengineering, and Biotransport Conference, June 2022, Cambridge, MD, USA.
4. **Alex Khang**, John Steinman, Xinzeng Feng, Chiara Camillo, Giovanni Ferrari, Michael S. Sacks, "Simulating the 3D Contractile Function of the Aortic Heart Valve Interstitial Cell," Heart Valve Society Meeting, March 2022, Miami, FL, USA.
5. **Alex Khang**, Quan Nguyen, Xinzeng Feng, Michael S. Sacks, "On the Relation Between 3D Aortic Valve Interstitial Cell Shape and Contractile Behavior," U.S. National Congress on Computational Mechanics (Virtual Meeting), July 2021.
6. **Alex Khang**, Quan Nguyen, Xinzeng Feng, Michael S. Sacks, "On the Relation Between 3D Aortic Valve Interstitial Cell Shape and Contractile Behavior," Summer Biomechanics, Bioengineering, and Biotransport Conference (Virtual Meeting), June 2021.
7. **Alex Khang**, Chiara Camillo, Giovanni Ferrari, Michael S. Sacks, "3D Contractile Responses of Normal and Diseased Human Aortic Valve Interstitial Cells," Heart Valve Society Meeting (Virtual Meeting), April 2021.
8. Michael S. Sacks, Emma Lejeune, **Alex Khang**, Xinzeng Feng, "Multi-scale modeling to determine heart valve interstitial cell contractile behaviors in synthetic microenvironments," Engineering Mechanics Institute International Conference (Virtual Meeting), March 2021.

¹equal contribution, co-first authors

9. Xinzeng Feng, **Alex Khang**, Jacob Sansom, Nicholas West, Emma Lejeune, and Michael S. Sacks, "High Fidelity Simulation of Heart Valve Interstitial Cell Contractile Behavior in 3D Gels," World Congress in Computational Mechanics (Virtual Meeting), January 2021, Paris, France.
10. **Alex Khang**, Emma Lejeune, Quan Nguyen, Xinzeng Feng, Ali Abbaspour, Daniel P. Howsmon, and Michael S. Sacks, "The Interrelationship Between Cell Shape and Local Deformation in Gel-embedded Valve Interstitial Cells," Biomedical Engineering Society Meeting (Virtual Meeting), October 2020, San Diego, CA, USA.
11. **Alex Khang**, William Larson, Emma Lejeune, and Michael S. Sacks, "The Interrelationship Between Aortic Valve Interstitial Cell Shape and Local Deformation in PEG Hydrogels," Summer Biomechanics, Bioengineering, and Biotransport (Virtual Meeting), June 2020, Vail, CO, USA.
12. **Alex Khang**, Ali Abbaspour, Chiara Camillo, Giovanni Ferrari, and Michael S. Sacks, "3D Contractile Responses of Normal and Diseased Human Aortic Valve Interstitial Cells," Summer Biomechanics, Bioengineering, and Biotransport (Virtual Meeting), June 2020, Vail, CO, USA.
13. **Alex Khang**, Andrea G. Rodriguez, Megan Schroeder, Kristi S. Anseth, and Michael S. Sacks, "On the use of Poly(ethylene) Glycol Hydrogels for Studying Valve Interstitial Cell Biomechanical States," Society for Biomaterials, April 2018, Atlanta, GA, USA.
14. **Alex Khang**, Andrea G. Rodriguez, Megan Schroeder, Kristi S. Anseth, and Michael S. Sacks, "Investigating Valve Interstitial Cell Mechanics Using A Synthetic Poly(ethylene glycol) Hydrogel," Biomedical Engineering Society Meeting, October 2017, Phoenix, AZ, USA.
15. **Alex Khang**, Andrea G. Rodriguez, Megan Schroeder, Kristi S. Anseth, and Michael S. Sacks, "Valve Interstitial Cell Mechanics Within a 3-D Poly(ethylene glycol) Hydrogel Environment," Summer Biomechanics, Bioengineering, and Biotransport Conference, June 2017, Tucson, AZ, USA.

Poster Presentations

1. **Alex Khang**, Robin Tuscher, Xinzeng Feng, Michael S. Sacks, "3D Computational Model of Aortic Valve Interstitial Cell Stress Fiber Contractile Behavior," Biomedical Engineering Society Annual Meeting, October 2022
2. **Alex Khang**, John Steinman, Xinzeng Feng, Michael S. Sacks, "A 3D Computational Contractile Model of the Aortic Valve Interstitial Cell," 4th Annual Mechanobiology Symposium, University of Pennsylvania, March 2022 (Virtual Meeting)
3. **Alex Khang**, Quan Nguyen, Xinzeng Feng, Michael S. Sacks, "The Correlation Between 3D Aortic Valve Interstitial Cell Shape and Contractile Behavior," Biomedical Engineering Society Annual Meeting, October 2021, Orlando, FL, USA.
4. **Alex Khang**, Emma Lejeune, Nicholas West, Jacob Sansom, and Michael S. Sacks, "Quantifying the Contractile Behavior of the Aortic Heart Valve Interstitial Cell at the Single-cell and Population-level Within a Highly Tunable Poly (ethylene glycol) Hydrogel," NAVBO Vascular Biology Meeting, October 2019, Monterey, CA, USA.
5. **Alex Khang**, Emma Lejeune, Jacob Sansom, Nicholas West, and Michael S. Sacks, "Quantifying the 3D Mechanical Traction of the Aortic Heart Valve Interstitial Cell," Biomedical Engineering Society Annual Meeting, October 2019, Philadelphia, PA, USA.
6. **Alex Khang**, Siliang Wu, John Carruth, Will Goth, James Tunnell, Elizabeth Cosgriff-Hernandez and Michael S. Sacks, "Characterization of Composite Electrospun-Hydrogel Materials for Prosthetic Heart Valves," Biomedical Engineering Society Annual Meeting, October 2018, Atlanta, GA, USA.

7. **Alex Khang**, Andrea G. Rodriguez, Megan Schroeder, Kristi S. Anseth, and Michael S. Sacks, "Mechanobiology of Valve Interstitial Cells Within a 3-D Poly(ethylene glycol) Hydrogel Environment," Biomaterials Day, May 2017, Austin, TX, USA.
8. **Alex Khang**, Prashanth Ravishankar, Patrick K. Anderson, and Kartik Balachandran, "Engineering Biphasic Janus-type Polymer-Protein Nanofibers via Centrifugal Jet Spinning," World Biomaterials Congress, May 2016, Montreal, QC, Canada.
9. **Alex Khang**, Prashanth Ravishankar, Aditya Krishnaswamy, and Kartik Balachandran, "Engineering Biphasic Janus-type Polymer-Protein Nanofibers via Centrifugal Jet Spinning," Biomedical Engineering Society Annual Meeting, October 2015, Tampa, FL, USA.

FELLOWSHIPS, SCHOLARSHIPS, AND GRANTS

National Institutes of Health T32 Postdoctoral Fellowship, CU Anschutz (\$54,840; 2022)
 Engineering Foundation Endowed Graduate University Fellowship (\$2,000; 2021)
 Dean's Prestigious Fellowship Award (\$1,000/year; 2021-2022)
National Institutes of Health F31 Predoctoral Fellowship (\$25,320/year; 2020-2022)
 Engineering Foundation Endowed Graduate Presidential Scholarship (\$2,600; 2020)
 Harry and Rubye Gaston Graduate Scholarship (\$2,500; 2019)
National Science Foundation Graduate Research Fellowship (\$34,000/year; 2017-2020)
 The Harry Philip Whitworth Endowed Graduate Fellowship Fund (\$2,100; 2017)
 Thomas Marschall Runge, M.D. Endowed Presidential Fellowship (\$3,500; 2016)
 University of Arkansas, Honors Travel Grant, Montreal, QC, Canada (\$1,200; 2016)
 Brandon Burlsworth Memorial Scholarship (\$5,000; 2015)
 Student Undergraduate Research Fellowship (SURF) Grant (\$4,000; 2015)
 SIIRE (Student Integrated Intern Research Experience) Scholarship (\$2,000/year; 2013-2016)
 University of Arkansas Academic Scholarship (\$4,000; 2013)
 University of Arkansas Chancellors Scholarship (\$8,000/year; 2012-2016)
 Arkansas Academic Challenge Scholarship (\$4,500/year; 2012-2016)
 APIASF (Asian and Pacific Islander American Scholarship Fund) (\$2,000; 2012)
 Arvest Bank Scholarship (\$1,000; 2012)

TECHNICAL STRENGTHS

Modeling and Analysis	Solidworks
Software, & Tools	FEniCS, MS Office Products, LaTeX, Image J, Paraview
Laboratory Equipment	Confocal Microscopy, Two-photon Microscopy, Fourier Transform Infrared Spectroscopy, Scanning Electron Microscopy, Energy-Dispersive X-ray Spectroscopy, Instron Testing Systems
Laboratory Skills	Sterile cell culture, Biomaterial fabrication, Microcontact printing, Mechanical testing of biological cells and soft tissues/materials
Programming	Matlab, Python, LabVIEW

MENTORSHIP

Undergraduate Research Assistants

1. John Steinman (2020-2022). Current position: PhD Student at Rice University.
2. Quan Nguyen (2018-2021). Current position: PhD Student at Boston University.
3. Ali Abbaspour (2018-2020). Current position: PhD Student at University of Wisconsin Madison.
4. Jacob Sansom (2018-2020).

5. Nicholas West (2018-2020).
6. Christian Gil (2016-2017).

TEACHING

Guest Lecturer, Texas A&M University (April 2023)

Delivered a guest lecture titled “Three-dimensional traction force microscopy” for course BMEN 463/663 (Soft Tissue Mechanics. Instructor: Professor Reza Avaz).

Guest Lecturer, UT-Austin (February 2020-2023)

Delivered a guest lecture titled “Functional biomechanics of the cell: a brief review of past and contemporary experimental techniques” for course ME 397 (Tissue Microenvironments: Fabrication, Transport, and Mechanics. Instructor: Professor Marissa Nichole Rylander).

Guest Lecturer, UT-Austin (11-29-2018)

Delivered a guest lecture titled “Multi-scale mechanical testing and modeling of cells and tissues” for course BME 385J (Tissue/Scaffold Biomechanics. Instructor: Professor Michael S. Sacks).

Certified Teaching Assistant, UT-Austin (August 2016 – December 2016)

Led and instructed laboratory sections and graded course assignments for course BME 303L (Introduction to Biomedical Engineering Design).

Undergraduate Tutor, Enhanced Learning Center, U of A (Fall 2014 – May 2016)

Tutored collegiate students from various educational, societal, and ethnic backgrounds. Instructed students in Cell Biology, Organic Chemistry, College Algebra, and Calculus.

Private Tutor, Lawson Coaching, Fayetteville, AR (August 2015-May 2016)

Served as a private tutoring consultant for College Algebra and Principles of Biology. Tutored high school and undergraduate students. Worked with students with learning disabilities.

OUTREACH

Austin Energy Middle and High School Science Fair, Austin, TX (February 2022)

Served as a judge in the topic areas of microbiology and behavioral sciences. Questioned contestants, provided constructive feedback, and helped in determining the placing of the contestants.

Big Brothers Big Sisters, Austin, TX (October 2020 – Present)

Provide companionship, mentorship, and guidance to a young man from an underprivileged background. Currently aiding in developing a plan for my mentee to attend college.

Surgical Volunteer, Mercy Hospital, Rogers, AR (January 2014 – January 2015)

Volunteered 178 total hours within the Department of Surgery. Transported patients into and out of surgery and prepared for surgical procedures by gathering surgical tools and machinery. Sanitized operating rooms before and after surgical procedures.

Volunteer, Feed Fayetteville, Fayetteville, AR (September 2014 – June 2015)

Volunteered 25 total hours. Maintained and cultivated community gardens to fight hunger in Fayetteville, AR. Recovered produce from local grocery stores for the local Salvation Army.

PROFESSIONAL MEMBERSHIP

Biomedical Engineering Society (2012 – Present)

North American Vascular Biology Organization (2019)

ACADEMIC ACHIEVEMENTS AND NOTABLE ACTIVITIES

Academic Achievements

1. **ASME-BED/SB3C PhD Student Paper Competition Runner-up (June 2022)**. One of 36 PhD students out of 130+ selected to compete in the PhD-level Student Paper Competition at the Summer Biomechanics, Bioengineering, and Biotransport conference. Placed second in the Cardiovascular Mechanics category.
2. **North American Vascular Biology Organization Poster Award (October 2019)**. Received an Outstanding Graduate Student Poster Award along with a monetary prize.
3. **Society for Biomaterials Abstract Honorable Mention (February 2018)**. Abstract nominated for outstanding contribution. Awarded honorable mention.
4. **BMES Coulter College Design Competition, Miami, Florida (August 2015)**. Served on a team representing the U of A and competed against other academic institutions. Produced designs and market analyses strategy for reducing strokes in Transcatheter Aortic-Valve Implantations. Granted monetary prize for best presentation in design and market analyses.

Notable Activities

1. **Biosensors and Force Measurements in Living Cells Carolina Workshop: CISMM NIH National Resource (May 2018)**. Attended the annual workshop on biosensors and force measurements in living cells at the University of Carolina at Chapel Hill.
2. **BME Summer Camp Outreach at U of A (June 2016)**. Led and instructed laboratory sections for high school students. Taught students confocal microscopy and tensile testing of dog-bone shaped soft materials.