

Axel C. Moore, PhD

Biomedical Research Scientist, University of Delaware
George W. Laird Merit Fellow, Whitaker Postdoctoral Fellow, Inaugural Houser Fellow

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Summary

A Research Scientist at the University of Delaware developing models of spinal growth modulation and quantifying the in vivo mechanics of the intervertebral disc and articular cartilage in human subjects. Previous work includes the discovery and theory of tribological rehydration (graduate work) and development of orthopaedic biomaterials for focal osteochondral defects (postdoctoral work). Currently, seeking to establish a translational research group in:

- (i) **In vivo tissue mechanics:** develop evidence-based guidelines for joint activity to recover and maintain healthy articular cartilage.
- (ii) **Translational biomaterials:** translate a clinically relevant poroelastic osteochondral implant to delay more advanced joint reconstruction
- (iii) **Orthopaedic growth modulation:** establish a preclinical large animal model to inform vertebral body tethering

The overarching goal of the research program is to develop evidence-based guidelines and advance the clinical outcomes of orthopaedic disorders, specifically osteoarthritis, osteochondral defects, and adolescent idiopathic scoliosis.

Education & Training

University of Delaware , Newark, DE Research Scientist Inaugural Houser Fellow Supervisor: Prof Dawn Elliott	2021 – Current
Imperial College London , London, UK Postdoctoral Research Associate Whitaker Postdoctoral Fellow Supervisor: Prof Molly Stevens	2017 – 2021
University of Delaware , Newark, DE PhD in Biomedical Engineering George W. Laird Merit Fellow Supervisor: Prof David Burriss	2012 – 2017

California Maritime Academy, Vallejo, CA
BS in Marine Engineering Technology
3rd Assistant Marine Engineer
Summa Cum Laude
Cadet Chief Engineer

2008 – 2012

Professional Experience

University of Delaware, Newark, DE

2021 – Current

Research Scientist

Developed an analysis pipeline and protocols to study growth modulation in a large animal model of scoliosis

- IACUC approved [806713]
- MRI scanning of animal subjects
- Worked with orthopaedic and large animal veterinary surgeons

In vivo mechanics of cartilage recovery in human participants – Principal Investigator

- IRB approved [1845187]
- MRI scanning of human subjects
- Worked with physical therapists and rehabilitation specialists

Off-axis Loading Fixture (OLaF™) for combined bending and quasi-static compression on a uni-axial test frame

- Designed to provide a cost-appropriate solution for multi-axis mechanical testing
- Patent Pending [63/353,108]

Mentored undergraduate and PhD students (see Mentoring and Supervision)

Imperial College Techcelerate Entrepreneurship Program, London, UK

2021

Postdoctoral Research Fellow

Technology and Customer Discovery Accelerator

- 3-months of entrepreneurship, business, and customer discovery training and implementation
- Establishing the customer: who the customer is, what do they want, why do they want it, and how can we make money
- Business planning and venture review with venture capitalists and business strategists

Imperial College London, London, UK

COVID-19 Outbreak (2020 – 2021)

Postdoctoral Research Fellow

Software developer for JAMVENT (emergency full intubation ventilator)

- JAMVENT was developed in response to the shortage of ventilators during the COVID-19 outbreak
- Meets all MHRA's requirements for a full intubation ventilator
- Wrote, edited, and documented LabVIEW code for JAMVENT
- Submitted an FDA Emergency Use Application

Imperial College London, London, UK

2017 – 2021

Postdoctoral Research Fellow

Led the Wellcome Trust Accelerator for Musculoskeletal Devices

- Designed and evaluated a microstructured zonal osteochondral scaffold (material fabrication, mechanical testing, biocompatibility, sterilization, cadaveric trials, animal studies)
- Drafted quarterly reports and met with surgeons, technology consultants, and orthopaedic representatives
- (1) Invention disclosure submitted
- (1) Patent maintained [US 9393097 B2]

Led the Articular Cartilage component of the UK Regenerative Medicine Platform

- Rigorously developed and evaluated a cartilage mimic that recapitulates the poroelastic mechanics of the native tissue
- Drafted quarterly reports and presented at Hub meetings
- (1) Invention disclosure submitted – patent application to be submitted following large animal trial (2021-2022)

Led the Biomaterials component for the NIHR project ‘PrOTeCT’

- Developed translational orthopaedic devices for traumatic injuries (non-union fractures and osteochondral lesions) with reference to post conflict areas (*e.g.*, Sri Lanka and Gaza)
- Drafted yearly reports and presented at advisory board meetings

Mentored undergraduate, masters, and PhD students (see Mentoring and Supervision)

University of Delaware, Newark, DE

2012 – 2017

Graduate Research Assistant

Led research on the tribo-mechanics (i.e. friction, wear, lubrication) of soft tissues, primarily articular cartilage

- Developed a tribo-mechanics model for Hertzian (spherical) contact of a poroelastic layer
- Discovered tribological rehydration – sliding induced fluid recovery in articular cartilage
- Built a high-speed rotary tribometer to study the limits of tribological rehydration
- Maintained inventory in the bio-tribology laboratory

Mentored undergraduate students (see Mentoring and Supervision)

California Maritime Academy, Vallejo, CA

2011 – 2012

Cadet Chief Engineer

Responsible for the “T/S Golden Bear”: a 500 ft ex-military ship with twin V-16 diesel engines with a rated output of 25,000 horse power running a single 5 bladed propeller

- Directed the repair and installation of machinery, personnel management, engineer training, safety, and drill procedures
- Conducted shipboard training evolutions every 2 months

Space Systems Loral, Palo Alto, CA

2011

Engineering Intern

Worked on a system to improve satellite mass predictions in the Main Body Bus Sub System

Honors and Awards

Inaugural Houdier Fellowship in Pediatric Spinal Deformity Growth modulation of the intervertebral disc in spinal deformity Children's Hospital of Philadelphia	2022
Postdocs & Fellows Development Centre Team Award Postdocs and Fellows Development Centre Imperial College London	2019
Allan P. Colburn Dissertation Prize Best Doctoral Thesis in Mathematical Sciences and Engineering University of Delaware	2018
Best Dissertation Award Biomedical Engineering University of Delaware	2018
Whitaker International Fellowship A functional tissue engineering approach to recapitulate the mechanics of articular cartilage Whitaker International Foundation	2017
Biomedical Engineering Distinguished Graduate Scholar Award Biomedical Engineering University of Delaware	2017
Graduate Dissertation Fellow Award Tribological rehydration of articular cartilage University of Delaware	2016
University Graduate Fellowship Award Modeling tribomechanics of articular cartilage University of Delaware	2015
Young Tribologist Award Society of Tribologists and Lubrication Engineers	2014
George W. Laird Merit Fellowship Awarded to one first year graduate student who displays excellence within and outside of science	2013
(2) Podium and (9) Poster Awards	2013 – Current

Peer Reviewed Publications

29 peer reviewed journal articles (11 first and 3 corresponding)

* Equal Contributor | + Corresponding Author

Google Scholar Metrics: 857 citations, 16 h-index (Sep 2022)

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|--|---|
| Minimum design requirements for a poroelastic mimic of articular cartilage
WS Tan, MM Stevens ⁺ , and AC Moore ⁺ | <i>Mech Behavior of Biomed Materials</i>
2022 |
| Translating musculoskeletal bioengineering into tissue regeneration therapies
A Khodabakus, T Guyer, AC Moore , MM Stevens, RE Guldborg, and N Bursac | <i>Science Translation Medicine</i>
2022 |
| In vitro and in vivo investigation of a zonal microstructured scaffold for osteochondral defect repair
AC Moore [*] , JAM Steele [*] , JP St-Pierre, SD McCullen, AJ Gormley, CC Horgan, CRM Black, C Meinert, T Klein, S Saifzadeh, J Ren, MA Woodruff, and MM Stevens | <i>Biomaterials</i>
2022 |
| The modes and competing rates of cartilage fluid loss and recovery
S Voinier, AC Moore , JM Benson, C Price, and DL Burris | <i>Acta Biomaterialia</i>
2021 |
| A novel ventilator design for COVID-19 and resource-limited settings
M Madekurozwa, WV Bonneuil, J Frattolin, DJ Watson, AC Moore , MM Stevens, J Moore, J Mathiszig-Lee, and J Batenburg-Sherwood | <i>Frontiers in Medical Technology</i>
2021 |
| Cartilage rehydration: The sliding-induced hydrodynamic triggering mechanism
C Putignano, DL Burris, AC Moore , and D Dini | <i>Acta Biomaterialia</i>
2021 |
| Range-of-motion affects cartilage fluid load support: Functional implications for prolonged inactivity
JM Benson, C Kook, AC Moore , S Voinier, C Price, and DL Burris | <i>Osteoarthritis & Cartilage</i>
2020 |
| Size-tunable nanoneedle arrays for influencing stem cell morphology, gene expression and nuclear membrane curvature
H Seong, SG Higgins, J Penders, JPK Armstrong, SW Crowder, AC Moore , JE Sero, M Becce, and MM Stevens | <i>ACS Nano</i>
2020 |
| Intermittent activity and the biomechanical response of cartilage to sliding: detrimental effects of long sedentary bouts
AC Moore [*] , BT Graham [*] , DL Burris, and C Price | <i>Connective Tissue Research</i>
2019 |

Spatial patterning of molecular cues and vascular cells in fully integrated hydrogel channels via interfacial bioorthogonal crosslinking

KT Dicker, **AC Moore**, NT Garabedian, H Zhang, SL Scinto, RE Akins, DL Burris, JM Fox, and X Jia

ACS App Mat & Interfaces
2019

How sliding and hydrodynamics contribute to articular cartilage fluid and lubrication recovery

DL Burris, L Ramsey, BT Graham, C Price, and **AC Moore**⁺

Tribology Letters
2019

Investigation of the mechanics, composition, and functional behavior of thick tribofilms formed from silicon- and oxygen-containing hydrogenated amorphous carbon

JB McClimon, AC Lang, Z Milne, N Garabedian, **AC Moore**, J Hilbert, F Mangolini, JR Lukes, DL Burris, ML Taheri, J Fontaine, and RW Carpick

Tribology Letters
2019

Buoyancy-driven gradients for biomaterial fabrication and tissue engineering

C Li, JPK Armstrong, L Ouyang, IJ Pence, AC Moore, Y Lin, CW Winter, and MM Stevens

Advanced Materials
2019

Cellular interactions with hydrogel microfibers synthesized via interfacial tetrazine ligation

S Liu, **AC Moore**, AB Zerdoum, H Zhang, SL Scinto, H Zhang, L Gong, DL Burris, AK Rajasekaran, JM Fox, and X Jia

Biomaterials
2018

Glycosylated superparamagnetic nanoparticle gradients for osteochondral tissue engineering

C Li, JPK Armstrong, IJ Pence, W Kit-Anan, JL Puetzer, SC Carreira, **AC Moore**, and MM Stevens

Biomaterials
2018

Core-shell patterning of synthetic hydrogels via interfacial bioorthogonal chemistry for spatial control of stem cell behavior

K Dicker, J Song, **AC Moore**, H Zhang, Y Li, DL Burris, X Jia, and J Fox

Chemical Science
2018

Mapping the spatiotemporal evolution of solute transport in articular cartilage explants reveals how cartilage recovers fluid within the contact area during sliding

BT Graham, **AC Moore**, DL Burris, and C Price

J of Biomechanics
2018

A review of methods to study hydration effects on cartilage friction

AC Moore, J Schrader, JJ Ulvila, and DL Burris

Tribology - Materials, Surfaces & Interfaces 2017

Unexpected tribological synergy in polymer blend coatings: Leveraging phase separation to isolate domain size effects and reduce friction

JA Emerson, N Garabedian, **AC Moore**, DL Burris, EM Furst, and TH Epps

ACS Applied Materials & Interfaces
2017

Cartilage and joint lubrication: New insights into the role of hydrodynamics

DL Burris and AC Moore*

Biotribology

2017

Sliding enhances fluid and solute transport into buried articular cartilage contacts

AC Moore, DL Burris, and C Price

Osteoarthritis & Cartilage

2017

Assessing quantitative metrics of transfer film quality as predictors of polymer wear performance

DR Haidar, J Ye, AC Moore, and DL Burris

Wear

2017

Tribological rehydration of cartilage and its potential role in preserving joint health

AC Moore and DL Burris

Osteoarthritis & Cartilage

2016

Quantifying cartilage contact modulus, tensile modulus, and permeability with Hertzian biphasic creep

AC Moore, JF DeLucca, DM Elliott, and DL Burris

J of Tribology

2016

Transfer film tenacity: A case study using ultra-low wear alumina-PTFE

J Ye, AC Moore, and DL Burris

Tribology Letters

2015

The interrelated effects of temperature and environment on wear and tribochemistry of an ultra-low wear PTFE composite

AC Moore*, HS Khare*, DR Haidar, L Gong, J Ye, JF Rabolt, and DL Burris

J of Physical Chemistry C

2015

Experimental characterization of biphasic materials using rate-controlled Hertzian indentation

AC Moore, BK Zimmerman, X Chen, XL Lu, and DL Burris

Tribology International

2015

Tribological and material properties for cartilage of and throughout the bovine stifle: Support for the altered joint kinematics hypothesis of osteoarthritis

AC Moore and DL Burris

Osteoarthritis & Cartilage

2015

An analytical model to predict interstitial lubrication of cartilage in migrating contact areas

AC Moore and DL Burris

J of Biomechanics

2014

In Review

Fiber reinforced hydrated networks recapitulate the poroelastic mechanics of articular cartilage

AC Moore, *et al.*, and MM Stevens

Adv Functional Materials

October 2022

In Preparation**Off-axis loading fixture for coupled compression and bending biomechanics**

AC Moore and DM Elliott

J of Biomechanical Engineering

October 2022

Quantifying scoliosis-like deformity progression in a porcine modelAC Moore, *et al.*, DM Elliott, and TP Schaer***JOR Spine***

December 2022

Other Archival Publications

Shining a light on the tribological rehydration of cartilage*Tribology Lubrication Technology*, August 2017**New insights into joint lubrication***Tribology Lubrication Technology*, May 2016**An analytical model for cartilage contact mechanics***Tribology Lubrication Technology*, August 2014**Relating the structure of articular cartilage to function***Tribology Lubrication Technology*, February 2014**Funding: Grants and Fellowships**

Secured \$50,370 in research grants as PI or Lead Applicant, \$176,500 in fellowships, and \$2,350 in travel and professional development awards. Secured two fully funded studentships (one masters and one doctoral) and \$1,400 for senior design prototyping. Assisted in securing a \$249,183 equipment grant from the NIH and a \$118,755 research grant from the Wellcome Trust to advance the technology readiness level of an orthopaedic implant.

NIH Equipment Grant

Project Title: BioRobotic joint testing system

Role: Project Lead

\$249,183

2022

COBRE III Year 1 Magnetic Resonance Imaging Pilot (\$10,000)

Project Title: In vivo cartilage recovery in covered and exposed contact areas

Role: Principal Investigator

\$10,000

2022

Inaugural Houdier Fellowship in Pediatric Spinal Deformity

Project Title: Growth modulation of the intervertebral disc in spinal deformity

Role: Awardee

\$15,000

2022

COBRE II Year 5 Magnetic Resonance Imaging Pilot

Project Title: Activity driven intermittent recovery of cartilage

Role: Principal Investigator

\$10,000

2021

Biomedical and Mechanical Engineering Senior Design	\$1,400
Project Title: A multi-axial test frame for in-vitro testing of differential biomechanics in scoliosis	2021
Role: Project Supervisor	
Techcelerate Customer Discovery	\$4,245
Project Title: Self-pressurizing bearing to support your cartilage	2021
Role: Principal Investigator	
Musculoskeletal Medical Engineering Centre Mini Sand-Pit Competition	\$18,625
Project Title: Mechano-chemical integration at the osteochondral interface	2019
Role: Lead Applicant in a collaboration with a chemist (Dr Jonathan Wojciechowski) and two additive manufactures (Dr Laura Ruiz and Dr Adja Toure)	
CDT in Fluid Mechanics Across Scales	Funded PhD Student
Project Title: Modes of nutrient transport for articular cartilage tissue engineering	2019
Role: Project Mentor	
UKRMP Pump Priming	\$7,500
Project Title: Fluid-solid interactions in fiber reinforced hydrated networks	2019
Role: Principal Investigator in a collaboration with 7 mathematicians (Prof Sarah Waters, Prof Andreas Munch, Prof John King, Prof Barbara Walters, Dr Matteo Taffetani, Dr Matt Hennessy, and Dr Susan Franks)	
CDT in Fluid Mechanics Across Scales	Funded MRes Student
Project Title: Fluid dynamics of a microstructured-scaffold delivery system	2019
Role: Project Mentor	
Wellcome Trust Accelerator for Musculoskeletal Devices	\$118,755
Project Goal: Increasing the Technology Readiness Level of two microstructured scaffolds under development by Dr Axel Moore	2018
Role: Lead Researcher	
Marie Skłodowska Curie Individual Fellowship	Seal of Excellence Reserve List
Project Title: Functional fiber reinforced hydrated networks	2018
Role: Lead Applicant	
Whitaker International Fellowship	\$53,000
Project Title: A functional tissue engineering approach to recapitulate the mechanics of articular cartilage	2017
Role: Awardee	
Graduate Dissertation Fellow Award	\$27,500
Project Title: Tribological rehydration of articular cartilage	2016
Role: Lead Applicant	
University Graduate Fellowship Award	\$42,500
Project Title: Modeling tribomechanics of articular cartilage	2015
Role: Lead Applicant	

E. Elmer Klaus Fellowship

\$6,500

Project Title: Localized cartilage damage can disrupt lubrication and initiate progressive osteoarthritis
Role: Lead Applicant

2015

National Science Foundation Graduate Research Fellowship

Honorable Mention

Project Title: Developing an analytical model for cartilage mechanics using in situ measures of function
Role: Lead Applicant

2013

George W. Laird Merit Fellowship

\$20,000

Awarded to one first year graduate student who displays excellence within and outside of science

2013

Invited Talks

9 invited talks

Imaging and Analysis of Spinal Deformity Progression

SRS Traveling Fellows Symposium, Philadelphia, PA, September 2022

Imaging and Analysis of Spinal Deformity Progression

Wyss-Campbell Center Symposium – Children’s Hospital of Philadelphia, Philadelphia, PA, June 2022

From Function, Growth, and Repair to the Recovery and Preservation of Human Joints

University of Kentucky Department of Orthopaedic Surgery and Sports Medicine, Lexington, KY, April 2022

From Function, Growth, and Repair to the Recovery and Preservation of Human Joints

New Jersey Institute of Technology Biomedical Engineering Seminar, Newark, NJ, February 2022

From Function, Growth, and Repair to the Recovery and Preservation of Human Joints

Brown University Department of Orthopaedics, Providence, RI, November 2021

A poroelastic mimic of articular cartilage

University College London’s Bloomsbury Centre for Skeletal Research, London, UK, January 2021

A cartilage-like material for osteochondral defect repair

Imperial College London Biotribology Group, London, UK, May 2019

New insights on restoring cartilage hydration

University of Pennsylvania Nanotribology Group, Philadelphia, PA, August 2017

Tribological rehydration: Maintaining and rebuilding interstitial fluid pressure in cartilage

Dartmouth Thayer School of Engineering, Hanover, NH, May 2015

Selected Podium Presentations

65 podium and 58 poster presentations at 30 national and 4 international conferences. Selected podium presentations listed below.

Disc and Nucleus Pulposus Asymmetry in a Porcine Model of Mechanically Induced Scoliosis

Biomedical Engineering Society Annual Meeting, 2022

Progressive Disc and Bone Adaptations due to Posterolateral Tethering in a Porcine Model of Scoliosis

Summer Biomechanics, Bioengineering, Biotransport Conference, 2022

Solid-Fluid interactions and osteogenic scaffolds

Regenerative Medicine Meets Mathematical Modelling, 2019

Cartilage-like performance of a fibre reinforced hydrated network

BioMedEng19, 2019

Does regular physical activity help mitigate cartilage strains

Summer Biomechanics Bioengineering and Biotransport Conference, 2017

Sliding induced solute transport into articular cartilage

Society of Tribologists and Lubrication Engineers Annual Meeting, 2017

Tribological rehydration: Directly observing the loss and recovery of interstitial fluid

Tribology Frontiers Conference, 2016

Tribological rehydration: Directly observing the loss and recovery of interstitial fluid

International Conference on Biotribology, 2016

Tribological rehydration I: A new mechanism of interstitial fluid recovery

Summer Biomechanics Bioengineering and Biotransport Conference, 2016

Tribological rehydration: Maintaining and rebuilding interstitial fluid pressure in cartilage

Biomedical Engineering Society Annual Meeting, 2015

Professional Education & Certifications

Certifications & Training

- | | |
|---|------|
| ○ Magnetic Resonance Operator | 2022 |
| ○ Human Subjects Protections | 2021 |
| ○ Biomedical Lab Animal Protections Training (Sheep, Goats, Pigs) | 2021 |
| ○ Level 1 and 2 Magnetic Resonance Personnel | 2021 |
| ○ Third Assistant Engineers License, US Coast Guard Certified | 2012 |
| ○ Certified Engineer in Training | 2012 |
| ○ EPA Certified Universal Technician | 2010 |

Professional Development Courses

- Assistant Supervisor – Imperial College London Postdoc Development Centre 2021
- Intellectual Property – Intellectual Property Office 2021
- LGBT+ Awareness Training – Imperial College London & Challenge 2020
- Let's Talk About Race (LTAR) – Imperial College London 2020
- Science Communication: Reaching a Wider Audience 2019
- Orthopaedic Research Society – NIH Grant Writing Course 2018

Teaching Experience

Orthopaedic Biomechanics – University of Delaware, Newark, DE 2022

Guest Lecturer

- Upper level undergraduate and graduate course (mechanical and biomedical engineers)
- Developed and delivered a lecture on articular cartilage lubrication
- Lecture included props and a live demo on poroelasticity

Senior Design – University of Delaware, Newark, DE 2022

Project Sponsor and Mentor

- Project Title: MR compatible in-vivo knee loading device
- Mentored a design team of 5 Biomedical and Mechanical Engineering seniors

Independent Study – University of Delaware, Newark, DE 2022

Project Advisor

- Project Title: Negating off-axis moments through passive rotational degrees of freedom
- Mentored 2 senior engineers in modifying a multi-axis test frame with a thrust bearing and spherical bearing

Senior Design – University of Delaware, Newark, DE 2021

Project Sponsor and Mentor

- Project Title: A multi-axial test frame for in-vitro testing of differential biomechanics in scoliosis
- Mentored a design team of 5 Biomedical and Mechanical Engineering seniors

Masters of Science in Surgical Innovation – Imperial College London, London, UK 2019

Guest Lecturer

- Graduate course for surgeons in residence, 14 students
- Developed and delivered a 2-hour lecture on biomaterials

Instrumentation and Design – University of Delaware, Newark, DE 2016

Graduate Teaching Assistant

- Graduate + undergraduate design course, ~20 students (5 projects)
- Defined the deliverables and preliminary design of an articular cartilage pin-on-disc tribometer

Biomechanics II – University of Delaware, Newark, DE

2014

Graduate Teaching Assistant

- Undergraduate lecture + laboratory modules, ~50 students
- Developed and supervised labs (dissection, mock surgery, Sawbone® mechanics, creep testing, data fitting and analysis)
- Graded all course work (homework, lab reports, and exams)
- Held discussion sections and office hours

Mentoring and Supervision

Mentored and supervised 24 undergraduates, 8 masters, and 5 PhD researchers from Mechanical Engineering, Biomedical Engineering, Materials, Bioengineering, Biochemistry, and Finance.

DOCTORAL CANDIDATES**Dione Holder**

- Mechanics of spinal deformity
- Expected graduation 2025

Tong Chu

- Porcine model of spinal deformity
- Converted to PhD in Biostatistics Department in 2022

Lorna Barron

- Orientation control of injected micro-scaffolds for retinal repair
- Expected graduation 2023

Øystein Øvrebø

- Biodegradable polymer resins for stereolithographic printing of bone tissue
- Converted to MPhil 2021
- Currently working in cartilage and bone R&D at Industrie Biomediche Insubri SA

Raya El Laham

- Injectable 3D multicellular constructs that guide photoreceptor polarization for the treatment of age-related macular degeneration
- Graduated 2022

MASTERS CANDIDATES**Shaobai Wang (MSc)**

- Coupling multi-arm amine functionalized polyesters to hyaluronic acid binding peptides
- Graduated 2021
- Currently a PhD candidate in polymer chemistry with Georgiou Fiona (Imperial College London)

Rory Horder (MEng)

- Production and bonding of stretch dominated subchondral bone mimics
- Graduated 2021
- Currently working at Sense Biodetection in R&D

Wei Shan Tan (Helen) (MEng)

- A biostable poroelastic mimic of articular cartilage
- Expected Graduation 2021
- Currently a PhD candidate in biosensing (TU/e)

Linfeng Wang (MRes)

- Controlling the temporal degradation of a synthetic bruch's membrane
- Graduated 2020

Øystein Øvrebø (MRes)

- Development of a biodegradable polymer resin for stereolithography printing of tissue engineering constructs
- Graduated 2019
- Currently working in cartilage and bone R&D at Industrie Biomediche Insubri SA

Melanie Flury (MRes)

- Development of a poly(ϵ -caprolactone)-peptide conjugate system for bone scaffold biomineralization
- Graduated 2019
- Currently a PhD candidate in biomaterials (Technion – Israel Institute of Technology)

Gregor Miklosic (MSc)

- A multizonal scaffold for osteochondral repair
- Graduated 2019
- Currently a PhD candidate in 3D bioprinting of the intervertebral disc (ETH Zürich)

Andrew Killeen (MRes)

- Fluid dynamics surrounding a microstructured scaffold for retinal repair
- Graduated 2019
- Currently a PhD candidate in computational fluid mechanics (Imperial College London)

UNDERGRADUATE STUDENTS

Tayah Burnett

- Spine deformity image segmentation
- Project period: Summer & Fall 2022

Shu-Jin Kust

- Activity Modulated Cartilage Recovery (image segmentation and image analysis)
- Project period: Winter, Spring, Fall 2022

Seán Magee

- Off-axis Loading Fixture (thrust bearing design)
- Project period: Spring 2022

Raith Nowak

- Off-axis Loading Fixture (spherical bearing design)
- Project period: Spring 2022

Hyungjip Lee

- Poroelastic mechanics (literature review and coding)
- Project period: Summer 2020

Wei Shan Tan (Helen)

- Functional characterization of fiber reinforced hydrated networks
- Project period: Autumn 2019 – Summer 2020
- Currently a PhD candidate in biosensing (TU/e)

Lukeriyah Zharova

- Optimization of a new electrospinning method and solvent
- Project period: Summer 2018
- Currently a PhD candidate in biomaterial interfaces (Imperial College London)

Benjamin Henry

- Baseline studies on the stress threshold for cartilage lubrication

Nick Negrón

- Pilot data for contact lens lubrication studies

Thomas McDowell

- Evolution of cartilage degradation

Sarah Leung, Stephen Faulkenberry, and Kathleen Wright

- Hydrogel mechanics

Ryan Moyer, Samantha Merta, and Kristina Valko

- Developed a method to evaluate the material properties of healthy and injured mouse knee joints

Robert Lackey, Tyler Kane, Michael Whiting, and Justin Drzal

- Tribological rehydration

David Sun

- Mechanobiology of tribological rehydration in articular cartilage

Jane Gosling

- Cartilage wear studies

Jordyn Schrader and Greg Driscoll

- Developing, measuring, and controlling suction

Lucas Ramsey

- Dynamics of tribological rehydration

Professional Service

ASSOCIATION OF LAIRD FELLOWS

President

2022 – Current

- Mission: To rewrite the Fellowship Charter to enhance our activities as a Fellowship and increase engagement with the University
 1. Rewrite the Fellowship Charter
 2. Launch a Laird Summer Fellows Program
- Led the annual Fellow selection committee

Vice President 2019 – 2022

- Organized yearly Fellowship selection committee (sub-committee and selection committee)
- Developed a new modern web platform for the Laird Fellowship
- Organized the 45th Fellowship reunion

Secretary 2016 – 2019

- Organized yearly Fellowship selection committee (sub-committee and selection committee)
- Sent all Fellowship communications
- Organized the 40th Fellowship reunion

MATERIALS POSTDOCTORAL REPRESENTATIVE 2018 - 2020

- Served on committees related to recruitment, safety, diversity, and career development
- Organized a Career Month for postdocs that featured 4 sessions: (i) Networking, (ii) Careers Within University, (iii) Job Applications Workshop, and (iv) Careers Outside University
- Organized the yearly Welcome Party, Department Activity (escape room experience), Holiday Party, and Summer Party
- Responsible for recruiting external sponsors for the 2018 postdoctoral research symposium
- Responsible for developing abstract submission and registration site for the 2019 postdoctoral research symposium
- Received the 2019 Team Award from the Postdocs & Fellows Development Centre

EXTERNAL THESIS EXAMINER

David Rebenda (Doctor of Philosophy at Brno University of Technology)

- Effect of viscosupplementation on friction of articular cartilage, 2021

Madison Ainsworth (Master of Applied Science at QUT)

- The development of strontium-substituted bioactive glass composite scaffolds for patient-specific bone repair, 2020

JOURNAL REVIEWER (27 manuscripts)

Biomedicines
Frontiers Bioengineering
Engineering Science and Technology
Journal of Testing and Evaluation
Osteoarthritis and Cartilage Open
Experimental Mechanics
Connective Tissue Research
Tribology Letters
Journal of Clinical Medicine
Journal of Biomechanical Engineering
Biotribology
Acta Biomaterialia
Tribology Transactions
Bone and Joint Diseases

Soft Matter
 Chemical Engineering Journal
 Materials
 International Journal of Molecular Sciences

CONFERENCE COMMITTEES

BMES Session Co-Chair	2022
<ul style="list-style-type: none"> ○ Biomechanics of Rehabilitation/Injury ○ Human Performance/Sports Biomechanics 	
BMES Abstract Reviewer	2022
<ul style="list-style-type: none"> ○ Subject matter reviewer 	
ASME-SB3C Student Paper Competition	2022
<ul style="list-style-type: none"> ○ Judge for PhD competition 	
ASME-SB3C Student Paper Competition	2021
<ul style="list-style-type: none"> ○ Reviewer for BS-level 	
9 th Materials Postdoctoral Research Symposium	2019
<ul style="list-style-type: none"> ○ Organized scientific content, abstract reviewer, coordinated catering 	
8 th Materials Postdoctoral Research Symposium	2018
<ul style="list-style-type: none"> ○ Recruited sponsors, coordinated catering 	
Center for Biomechanical Engineering Research Day	2017
<ul style="list-style-type: none"> ○ Abstract reviewer 	

SOCIETY MEMBERSHIP

International Cartilage Regeneration & Joint Preservation Society	2019 – Current
Biomedical Engineering Society	2014 – Current
Orthopaedic Research Society	2014 – Current

Public Engagement

STEM in Action, London, UK 2021

Developed digital content to deliver public engagement activities during the COVID-19 pandemic.

Content:

- Research lecture – recorded
- Path through science – poster and slide deck
- Home based poroelasticity experiment – recorded with voice over and experimental protocol

I'm a Scientist, Get me out of here!, London, UK 2021

Participated in the Orange Zone, which is a general science-themed Zone, featuring scientist from a broad range of fields. I'm a Scientist facilitates an online chat platform that allows students and educators to ask questions about science.

Great Exhibition Road Festival, London, UK 2019

A 3-day public engagement event with 45,000 attendees. Led the design, fabrication, and implementation of a magnetic lateral flow assay. The carnival like nature of the game drew some of the largest crowds and public engagement of any activities at the festival.

Wohl Reach Out Lab, London, UK 2018 – 2021

As an academic leader, I designed and conducted educational modules for primary and secondary students. Trained and directed Masters and PhD student assistants in module safety, course material, and expected outcomes.

Courses Developed:

- STIXX – students learned how geometry can convert a flimsy sheet of paper into a functional load bearing member that can be used to build structures, e.g., chairs and bridges
- $PV=nRT$ – secondary students ran experiments and watched demonstrations that gave rise to Boyle's, Charles', Lussac's, and Avogadro's Laws, and how their laws came together to yield the ideal gas law
- Diode Bridge – secondary students learned how to use a variable power supply, oscilloscope, resistors, diodes, capacitors, and light emitting diodes
 - Students assembled and tested half wave, full wave, and filtered full wave rectifier circuits
 - Lesson provided hands-on and visual evidence as to how and why AC power is converted to DC power

STLE Annual Meeting Outreach, Lake Buena Vista, FL 2014

Conducted the Leonardo da Vinci experiment for a local high school. Students found that the apparent area of contact doesn't influence the frictional response. Assisted in demonstrating how an atomic force microscope works.

K-12 Engineering Outreach, Newark, DE 2012 – 2017

Developed and taught relevant engineering modules on my research—cartilage mechanics, tribology, osteoarthritis, anatomy, and bone mechanics.

Courses Developed:

- Built a custom air hockey table to describe cartilage mechanics
- Measured the friction coefficient of different materials
- Mock orthopaedic devices were implanted in surrogate bone to demonstrate bone loading mechanics and orthopaedic intervention
- Bovine stifle joint (cow knee) dissection