

Alexander J. Boys

Materials Science and Engineering

Cornell University

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PROFILE

NIH Fellow, enrolled in Ph.D. program in Materials Science and Engineering at Cornell University. Researching stifle joint meniscal attachments for the purpose of advancing medical knowledge on the subject and developing tissue engineered meniscus implants. Academic research experience in tissue characterization, tissue engineering, microfluidics, crystallography, glass science, and metallurgy. Professional experience in medical industry.

ACADEMIC BACKGROUND

Cornell University

Ithaca, NY

Ph.D. in Materials Science and Engineering expected December 2018

Minor in Biomedical Engineering

Committee: Dr. Lara Estroff, Dr. Lawrence Bonassar, Dr. Eve Donnelly

May 2016 – Present

Cornell University

Ithaca, NY

M.S. in Materials Science and Engineering

Minor in Biomedical Engineering

August 2013 – May 2016

Lehigh University

Bethlehem, PA

B.S. with high honors in Materials Science and Engineering

Minor in Chinese Language

August 2009 – May 2013

The Hill School

Pottstown, PA

September 2005 – May 2009

APPOINTMENTS & RESEARCH EXPERIENCE

Cornell University

Ithaca, NY

NIH F31 Fellow (Award Number: F31AR070009) / Graduate Research Assistant

- Generating tissue engineered co-cultured meniscal attachments by integrating cell-seeded gels with cell-seeded bone constructs that contain mineral gradients
- Analyzing repaired cartilage-native cartilage interface from autologous chondrocyte transplantation (ACT) study in an equine model using elastography and Raman microscopy
- Characterized native meniscal attachments using spatially registered confocal fluorescent elastography and Raman imaging to develop microscale structure-function relationship

August 2013 – Present

NSF EAPSI Fellowship

Beijing, China

Fellow (Award Number: 1614159)

- Researched microfluidics for generating osteochondral interface at National Center for Nanoscience and Technology (NCNST) of the Chinese Academy of Sciences (CAS) under Dr. Xingyu Jiang
- Fabricated device for subjecting biocompatible gels to chemical stimulants

June 2016 – May 2017

International Institute for the New Functionality of Glass

Bethlehem, PA

Research Scholar

- Synthesized dual-porous bioactive glass with controllable surface area using sol-gel technique
- Generated commercial-grade bioactive glass using the melt-quench technique

February 2012 – July 2013

Aesculap Implant Systems
Bethlehem, PA
Product Development Team Member

January 2012 – December 2012

- Worked on multidisciplinary team of engineering and business students to develop medical device with accompanying business model
- Designed and fabricated expandable lumbar interbody fusion implant for increased ease of surgery

Stryker Orthobiologics
Malvern, PA
Intern Quality Engineering

May 2012 – August 2012

- Conducted failure analysis on various materials related to product development
- Devised a method to determine the degradation rate for collagen-based hemostat

Orthovita, Inc. / Stryker Orthobiologics
Malvern, PA
Intern in R&D / Clinical Departments

May 2011 – August 2011

- Devised and performed mechanical testing methods for bioactive implants in sheep vertebrae
- Produced Monte Carlo simulation to model patient enrollment for six-year clinical trial

AWARDS & DISTINCTIONS

NIH F31 Fellowship (Award Amount: \$130,728)	2017
ICCBMT Travel Award (Award Amount: \$1,000)	2017
Morel Graduate Fellowship (Award Amount: \$6,288)	2016
NSF EAPSI Fellowship (Award Amount: \$5,400)	2016
Bradley Stoughton Student Award	2013
Dow Scholarship (Award Amount: \$5,000)	2013
John McMullen Fellowship (Award Amount: \$56,560)	2013
3rd Place PMAD Challenge	2013
Tau Beta Pi	2012
Lehigh In-house Metals Award	2012
Alpha Sigma Mu	2012
2nd Place PMAD Challenge	2012
Phi Eta Sigma	2012

PUBLICATIONS

1. **A.J. Boys**, M. Walsh, "Cold Casting: Materials Science for Introducing Engineering Concepts at an Earlier Age," *In prep.*, 2018.
 2. L.E. Iannucci, M.C. McCorry, **A.J. Boys**, L.A. Estroff, L.J. Bonassar, "Development of Tissue Engineered Co-Culture Meniscal Enteses with Localized Solute Gradients," *In prep.*, 2018.
 3. **A.J. Boys**, J.A.M.R. Kunitake, C.R. Henak, I. Cohen, L.A. Estroff, L.J. Bonassar, "Understanding the Stiff-to-compliant Transition of the Meniscal Attachments through Spatial Registration of Raman Microscopy and Confocal Elastography," *Submitted*, 2018.
 4. **A.J. Boys***, M.C. McCorry*, S. Rodeo, L.J. Bonassar, L.A. Estroff, "Next Generation Tissue Engineering of Orthopedic Soft Tissue-to-Bone Interfaces," *MRS Communications*, 7: 289 – 308, 2017.
- *Co-first Authors

ORAL PRESENTATIONS

1. **A.J. Boys**, J.A.M.R. Kunitake, L.J. Bonassar, L.A. Estroff, "Characterization of Compositional Gradients by Raman Spectromicroscopy of the Meniscal Enteses," *12th ICCBMT*, Oral Session 5, Talk 3, Potsdam, Germany, 2017.

2. **A.J. Boys**, J.A.M.R. Kunitake, L.A. Estroff, L.J. Bonassar, "Raman Microscopy Reveals Local Morphological Features in the Meniscal Entesis," *ORS 2017 Annual Meeting*, Session 51, Paper 2273, Volume 42, San Diego, CA, 2017.
3. **A.J. Boys**, C.R. Henak, I. Cohen, L.A. Estroff, L.J. Bonassar, "High Resolution Strain Mapping of the Meniscal Enteses," *ORS 2016 Annual Meeting*, Session 8, Paper 70, Volume 41, Orlando, FL, 2016.

POSTER PRESENTATIONS

1. **A.J. Boys**, C.Z. Zhao, K.M. Chan, L.A. Estroff, L.J. Bonassar, "Linear Regression of High Resolution Raman Data of Cartilage Enables Mapping of Molecular Constituents," *ORS 2018 Annual Meeting*, New Orleans, LA, 2018.
2. RM Irwin*, **AJ Boys***, LA Estroff, LJ Bonassar, "Microscale Correlative Analysis of Mechanics and Composition on the Integration of Repaired and Native Cartilage," *ORS Upstate New York and Northeast Regional Symposium*, Rochester, NY, 2017.
*Co-first Authors
3. K.M. Chan, **A.J. Boys**, L.J. Bonassar, L.A. Estroff, "Characterization of Articular Cartilage by Raman Spectromicroscopy," *2016 BMES Annual Meeting*, Minneapolis, MN, 2016.
4. **A.J. Boys**, J.A.M.R. Kunitake, G.R. Waidyaratne, I. Cohen, L.A. Estroff, L.J. Bonassar, "Characterizing the Structure-function Relationship of the Meniscal Enteses via Microstrain Mapping and Raman Spectroscopy," *2015 MRS Fall Meeting*, Boston, MA, 2015.

LEADERSHIP & TEACHING EXPERIENCE

Cornell University
Ithaca, NY

August 2013 – Present

Graduate Research Assistant

- Mentoring M.S. student on project directed at characterizing matrix deposited by cultured stem cells and three undergraduate students on various aspects of other projects
- Presented laboratory research on behalf of Dr. Lawrence Bonassar to generate interest in joining the Bonassar Research Group from incoming Ph.D. and M.S. students
- Invited to moderate a session at the ORS Regional Symposium in Rochester, NY
- Advised M.Eng. student and HHMI CHAMPS Fellow for development of tissue engineering protocols
- Attended the 10th China-US Young Scientist Forum in Beijing, China, organized to promote international collaboration between upcoming scientists and researchers
- Chaired a session on biomaterials at the Cornell Materials Science and Engineering Graduate Student Symposium
- Advised seven undergraduate students on various long term research projects, resulting in a conference presentation
- Selected as ambassador to prospective students for Materials Science and Engineering department
- Requested to host International Cartilage Research Society (ICRS) Fellows during their visit to Cornell University
- Chosen to support admissions office in providing examples of excellence in science at Cornell University for accepted students
- Requested to assist Cornell Center for Materials Research (CCMR) by providing data for center renewal application from NSF

Cornell Center for Materials Research
Ithaca, NY

October 2013 – Present

Researcher

- Developing hot casting laboratory experiment for implementation in high schools
- Designed laboratory cold casting experiment for introducing engineering and design concepts to students at an earlier age
- Presented cold casting laboratory at teacher's workshop in New York, NY

- Working to spread lesson plans for casting experiment, available online through CCMR Lending Library, to teachers across world
- Demonstrated materials and biomedical engineering as career paths to students at middle schools near Ithaca, NY
- Taught science classes for elementary school, middle school, and high school students in Ithaca, NY and the Bronx, NY

Cornell University
Ithaca, NY

August 2014 – December 2016

Teaching Assistant for Biomaterials for the Skeletal System

- Acted as teaching assistant for 50 first year undergraduate students over two semesters
- Taught concepts involving biomaterials integration, wound healing, and biomechanical principles
- Mentored students in choosing undergraduate majors
- Aided students in producing academic posters on FDA-approved implant devices

Lehigh University
Bethlehem, PA

January 2013 – May 2013

Grader for Processing and Properties of Metals

- Selected by professor for excellence in knowledge of metallurgy to act as grader
- Acted as sole grader for 25 undergraduate third and fourth year students

Community Service

- Demonstrated tissue engineering principles at local elementary school
- Tutored children from low income families as a high school student
- Participated in NanoDays as an undergraduate, teaching children about science concepts
- Invited to organize science outreach event at Carnegie Mellon for American Chemical Society

SKILLS & OTHER

Technical Experience:

- Biological – cell culture, histology, dissections, fixation, bioactivity testing, analytical X-ray, CT
- Material Synthesis – gel production, microfluidics, sol-gel chemistry, glass and metal casting
- Microscopy – confocal, optical, fluorescence, elastography, SHG, SEM, TEM, AFM
- Materials Characterization – Raman, FTIR, EDS, X-ray diffraction, mechanical testing
- Materials Preparation – carbon coating, sputter coating, microtome, cryotome, vibratome
- Programming – MATLAB, Mathematica, R, SolidWorks, C++, DICTRA, Thermocalc, LabVIEW

Language Experience:

- Worked in Beijing for two months at the National Center for Nanoscience and Technology (NCNST)
- Minored in Chinese Language during undergraduate degree
- Studied Chinese Language in high school, including Chinese AP high school coursework
- Possesses advanced proficiency in Chinese and basic proficiency in French, German, and Latin

Responsible Conduct of Research Training:

- Completed responsible conduct of research class for biology-related fields at Cornell University
- Received certificate for completing CITI course for Biomedical Sciences
- Attended informal training through various sources at Cornell University

REFERENCES

Lara A. Estroff

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Cornell University

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Sibley School of Mechanical Engineering
Professor

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Associate Professor

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University of Ottawa