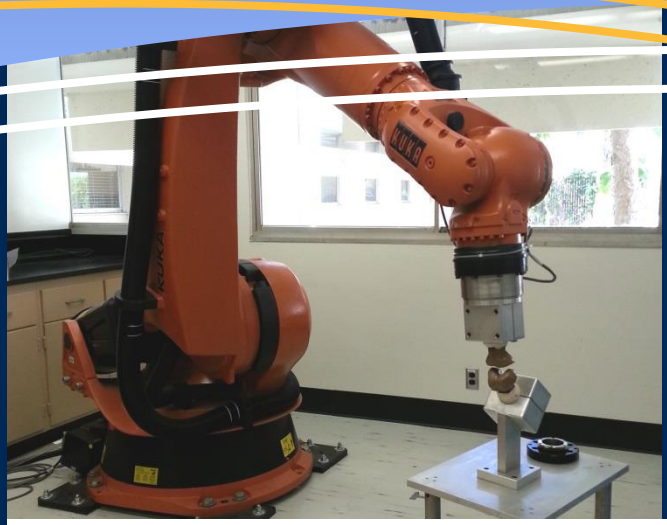
UCLA Orthopaedic Biomechanics
Annual Newsletter



Year in Review

July 2014 - June 2015

David McAllister, MD

Keith Markolf, PhD

Daniel Boguszewski, PhD

Frank Petrigliano, MD

Kristofer Jones, MD

UCLA Orthopaedic Biomechanics Laboratory

The primary focus of the UCLA Orthopaedic Biomechanics Laboratory is in sports medicine and orthopaedic surgery, with an expertise in knee injury and repair. Our research group consists of David McAllister, MD, Keith Markolf, PhD, Daniel Boguszewski, PhD, Frank Petrigliano, MD, and Kristofer Jones, MD.

Dr. McAllister a Professor of Orthopaedic Surgery and chief of the sports medicine service at UCLA. He specializes in all areas of orthopaedic sports medicine and has special expertise in knee ligament injuries and knee ligament biomechanics. In addition to running a busy sports medicine practice, he is actively involved in research and in the education and mentoring of medical students, residents, and fellows in both the basic science and clinical research arenas.

Dr. Markolf is a Professor of Orthopaedic Surgery with over 40 years of research experience in the area of biomechanics. He invented and developed a special technique for directly measuring forces in both cruciate ligaments of the knee with custom designed load cells. This has brought prominence to UCLA, as we are the only lab in the world using this direct measurement technique.

Dr. Boguszewski is an Assistant Professor of Orthopaedic Surgery. His expertise is in using a robotic manipulator to study knee joint biomechanics to improve injury prevention and repair techniques. With a background in mechanical and biomedical engineering, his specialty is in developing methods and techniques to utilize the robot to applying physiologic loading conditions to the knee.

Dr. Petrigliano is an Assistant Professor of Orthopaedic Surgery specializing in knee, shoulder, and elbow injury. Dr. Petrigliano is extensively involved in both clinical and laboratory research, with interests including cartilage repair and transplantation, arthroscopic shoulder repair (rotator cuff tears and labrum tears), arthroscopic shoulder stabilization, cruciate ligament reconstruction, and elbow ligament reconstruction.

Dr. Jones is an Assistant Professor of Orthopaedic Surgery specializing in knee, shoulder, and elbow injury. His specific interest is in joint preservation procedures, including modern cartilage restoration and transplantation techniques. Active in both clinical and laboratory research, his interests include the surgical treatment of shoulder and elbow injuries in the throwing athlete and articular cartilage restoration procedures in the knee.

David Geffen School of Medicine | UCLA Health

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Future Scientists

For the 2014-2015 academic year, we had the opportunity to train and mentor three young investigators in orthopaedic research.

Edward Cheung, M.D.

Ed joined our group as an Orthopaedic Research Resident after completing his second year of residency in Orthopaedic Surgery at UCLA. He has since moved on to his third year of residency at UCLA .

Nirav Joshi, M.D.

Nirav entered his second year with our group as an Orthopaedic Research Fellow after completing his medical degree at the University of Miami. He has since started his intern year at the University of Miami with a residency position in Radiology at Mount Sinai Medical Center to follow.

Katherine Moses

Katie joined our group as an Orthopaedic Research Intern during the summer months of 2014 between her junior and senior years of high school. She was the first intern in our newly established collaboration with Marymount High School promoting women in science. She is currently beginning her first year of undergraduate work at USC.

Drs. McAllister and Markolf have had a longstanding collaboration with significant contributions and high quality publications in the field of orthopaedic research. Their vast experience and combination of expertise from both a clinical and basic science perspective has established the UCLA Orthopaedic Biomechanics Lab as a leader in orthopaedic research. Together they have worked to train and mentor Dr. Boguszewski to lead the lab into exciting new and innovative areas of research.

Internship Program on display on Sunset Blvd.

Dr. Boguszewski's expertise is in biomedical engineering and robotics. The use of a robotic testing system to study knee joint function allows combined motion and force control to measure corresponding kinematic instabilities under simulated physiologic conditions. Our innovative approach provides an opportunity for enhanced studies of the knee that have never before been performed, providing insight into physiologic function and mechanisms of knee injury.

The UCLA Orthopaedic Biomechanics Lab is focused on training future clinician scientists in the area of orthopaedic research. We have had sustained success in mentoring and training the next generation of researchers, from residents and medical students to undergraduate students and high school interns. It is a core belief in our lab that teaching passionate young investigators in orthopaedic research is fundamental to the future of our field. For the first time, we have established a summer internship position with Marymount High School focused on promoting women in science. With this position, we hope to educate and inspire young women leaders in science and research.

We also participated in the Bioengineering Capstone Design Project with a group of undergraduate senior biomedical engineers tasked with developing a coating to adhere to cartilage in the knee. The goal is to have the coating slowly wear away when subjected to physiologic loading, provide an indication of wear patterns and allowing a quantitative characterization of force acting on the cartilage. The project progressed to the stage of adhering to cartilage surfaces. A new group of senior bioengineers will continue this work in the upcoming year.

Ed Cheung, MD and Nirav Joshi, MD working in the lab.

Nirav Joshi, MD providing instruction to Katie Moses.

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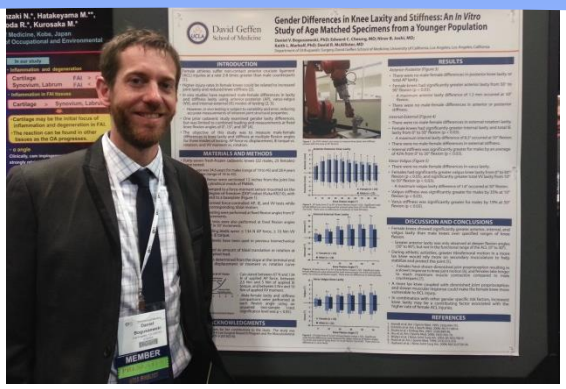
Ed Cheung, MD presenting at the annual local Longmire Scientific Day.



Dan Boguszewski, PhD presenting at the annual national Orthopaedic Research Society Meeting.

Over the past year we have had three articles published in highly respected journals (with an additional five articles currently in the review process), and had the opportunity to present our work at local and national conferences as both podium and poster presentations.

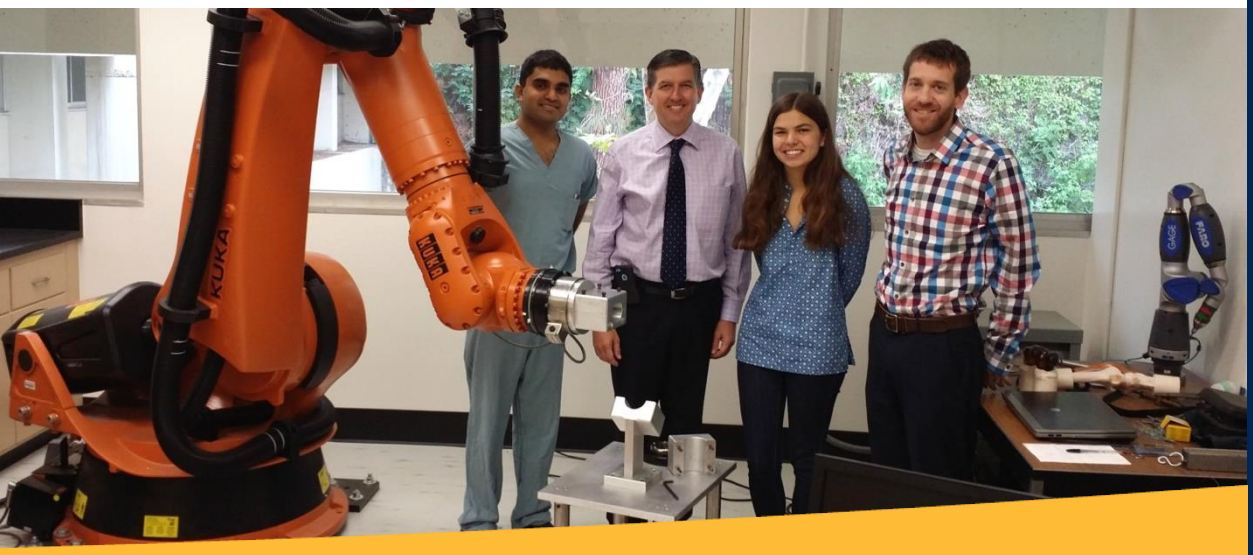
Published Journal Articles

1. Boguszewski DV, Wang D, Joshi NB, Petrigliano FA, Markolf KL, McAllister DR. The Effect of Different Preconditioning Protocols on Anterior Knee Laxity After ACL Reconstruction with Four Commonly Used Grafts. J Bone Joint Surg Am. 2015 Jul 1;97(13):1059-66. PMID: 26135072.
2. Cheung EC, Joshi NB, Boguszewski DV, Wang D, McAllister DR. Anatomic Factors that May Predispose Female Athletes to ACL Injury. Curr Sports Med Rep. 2015 Sep-Oct;14(5):368-72. PMID: 26359837.
3. Boguszewski DV, Cheung EC, Joshi NB, Markolf KL, McAllister DR. Gender Differences in Knee Laxity and Stiffness: A Cadaveric Study. Am J Sports Med. [In Press].

Podium Presentations

1. Boguszewski DV, Joshi NB, Wang D, Markolf KL, Petrigliano FA, McAllister DR. Does Preconditioning an ACL Graft Prior to Fixation Reduce Anterior Laxity During Cyclic Anteroposterior Testing? Presented at the 82nd Annual American Academy of Orthopaedic Surgeons (AAOS) Meeting, Las Vegas, Nevada, March 2015.
2. Boguszewski DV, Cheung EC, Joshi NB, Markolf KL, McAllister DR. Gender Differences in Knee Laxity and Stiffness: An In Vitro Study of Age Matched Specimens from a Younger Population. New Investigator Recognition Award Finalist. Presented at the 61st Annual Orthopaedic Research Society (ORS) Meeting, Las Vegas, Nevada, March 2015.
3. Boguszewski DV, Joshi NB, Cheung EC, Yang PR, Markolf KL, McAllister DR. A New Joint Coordinate System for Robotic Testing of Cadaveric Knee Specimens. Presented at the 2015 Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C), Snowbird, Utah, June 2015.
4. Cheung EC, Boguszewski DV, Joshi NB, Markolf KL, McAllister DR. Gender Differences in Knee Laxity and Stiffness: A Cadaveric Study. Presented at the 2015 Longmire Scientific Day, Los Angeles, California, March 2015.

Pictured (left to right): Nirav Joshi, MD, David McAllister, MD, Katie Moses, Dan Boguszewski, PhD.



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Honors and Awards

Dr. Boguszewski

New Investigator Recognition Award Finalist at the 2015 Orthopaedic Research Society Meeting

Dr. Cheung

1st Place Poster Award at the 2015 Western Orthopaedic Association Meeting

Special Thank You to Our Supporters

Our research endeavors are made possible through grant funding and the generous contributions of our supporters.

Anne and Arnold Charitable Foundation

Avram and Dorothy Salkin

Ruby Family Foundation

Ken and Wendy Ruby

Research Support

H & H Lee Surgical Research Scholars, University of California Los Angeles
Cheung (PI)
Project Period: 07/01/2014 - 06/30/2015
"The Effect of Tibial Slope Reducing Osteotomy on Anterior Cruciate Ligament Force and Knee Kinematic Stability"
The purpose of the grant is to examine the effects of an anterior closing wedge osteotomy on ACL force and knee joint kinematics.

Orthopaedic Research and Education Foundation (OREF #20141029), Resident Research Grant
Wang (PI)
Project Period: 07/01/2014 - 06/30/2015
"Preconditioning of Hamstring Tendon Grafts for Anterior Cruciate Ligament Reconstruction"
The purpose of the grant is to evaluate different preconditioning protocols for hamstring tendon grafts used in ACL reconstruction.

Musculoskeletal Transplant Foundation (MTF #20130216), Young Investigator Award
Boguszewski (PI)
Project Period: 02/01/2013 - 01/31/2015
"Comparing Tension Board Versus In Situ Preconditioning of Allograft Tissue Used for Anterior Cruciate Ligament Reconstruction"
The purpose of the grant was to evaluate different ACL graft preconditioning protocols for different allograft tissue types.

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Pictured (left to right): Ed Cheung, MD, Paul Yang, MD (previous research fellow), Dan Boguszewski, PhD, Nirav Joshi, MD, Keith Markolf, PhD, David McAllister, MD, Lindsey McAllister (future research intern)