



Department of  
Biomedical Engineering  
UNIVERSITY OF WISCONSIN-MADISON

## Fall 2019 Seminar Series

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# Deconstructing mechanotransduction to identify new drug targets for joint disease

**Farshid Guilak, PhD**  
Professor of Orthopaedic Surgery at  
Washington University and Director of  
Research at St. Louis Shriners Hospitals  
for Children



Osteoarthritis represents a painful and debilitating family of joint diseases, and it is now well accepted that biomechanical factors play an important role in the onset and progression of this disease. A major focus of our lab has been to investigate the mechanisms by which mechanical loading affects the physiology of the joints. Using a hierarchical approach to span different systems, ranging from clinical studies and in vivo animal models to studies at the tissue, cellular, and subcellular scale, we have identified specific mechanobiologic signaling pathways that regulate cartilage physiology, pathology, and mechanically-induced regeneration. These pathways provide novel pharmacologic targets for the modification of cartilage degeneration in osteoarthritis. Our work has led to the identification of several mechanical signal transduction pathways in chondrocytes that involve the activation of mechano- and osmo-sensitive ion channels, such as those in the transient receptor potential (TRP) and Piezo families. These pathways may provide novel pharmacologic targets for the modification of biomechanically-induced cartilage degeneration in osteoarthritis, as well as the enhancement of cartilage growth and regeneration.

*Dr. Farshid Guilak is a Professor of Orthopaedic Surgery at Washington University, Director of Research for the St. Louis Shriners Hospitals for Children, and co-director of the Washington University Center of Regenerative Medicine. He also has appointments in the Departments of Developmental Biology and Biomedical Engineering. His laboratory is pursuing a multidisciplinary approach to investigate the etiology and pathogenesis of various musculoskeletal diseases – particularly osteoarthritis – as a basis for developing new stem cell-based therapies. His laboratory reported one of the initial studies identifying the adipose stem cell and its ability for chondrogenesis. More recently, his laboratory has spearheaded the application of synthetic biology to stem cells in the context of regenerative medicine. He has published over 330 articles in peer-reviewed journals and has co-edited four books. He is the Past-president of the Orthopaedic Research Society. Dr. Guilak is the editor-in-chief of the Journal of Biomechanics, Associate editor for Osteoarthritis & Cartilage, and serves on several other journal editorial boards. He has won several national and international awards for his research and mentoring. He is also the Founder and President of Cytex Therapeutics, a startup company focusing on developing new regenerative medicine therapies for musculoskeletal conditions.*



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**Monday, September 30**  
**12 PM in Tong Auditorium (1003 Engineering Centers)**