

The Department of Mechanical Engineering Presents

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Title: The mechanics and mechanobiology of rotator cuff healing and repair

Abstract: Mechanical force plays an essential role in shaping cells, tissues, and organs of plants and animals. The US NSF Science and Technology Center for Engineering MechanoBiology aims to define how molecules, cells and tissues integrate mechanics within plant and animal biology, and to thereby create new therapies, materials, and agricultural technologies. At the core of CEMB's approach to mechanobiology are the questions of how cells feel, adapt, and remember their mechanical environments. Motivated by the challenge of surgeries seeing to reattach tendon to bone, this talk will describe work from our center on how wound-healing cells called fibroblasts feel, adapt, and remember the mechanical cues that cause them to transformation from an initially inactive state to a contractile, proliferative state called a myofibroblast. Myofibroblasts aid wound healing when triggered appropriately, but lead to significant morbidity when triggered pathologically. Key themes are the role of rigorous quantitative engineering tools in understanding these problems, and the need for tightly integrated theory and experiment as the field progresses towards a predictive science. The talk will conclude with a description of technologies currently under development to apply mechanical and mechanobiological insight to improved tendon-to-bone repair.



About the Speaker: Guy M. Genin studies mechanobiology, with focus on interfaces and adhesion in nature, physiology, and engineering. His work advances improved surgical techniques, therapies for tissue inflammation and fibrosis, and hardier crops that require fewer resources. At Washington University, he is the Harold and Kathleen Faught Professor, with appointments in Mechanical Engineering, Biomedical Engineering, and Neurological Surgery. He is the McDonnell International Scholars Academy Ambassador to Xi'an Jiaotong University in China, where he serves as Thousand Talents Plan Professor of Life Sciences. Genin co-directs the NSF Science and Technology Center for Engineering Mechanobiology and is chief engineer of Caeli Vascular, Inc. A fellow of ASME and AIMBE, Genin is the recipient of awards for engineering design, teaching, and research including a Research Career Award from NIH; the Skalak Medal from ASME; the Changjiang Scholar Award from the Chinese Ministry of Education; Professor of the Year from the Washington University Student Union; and the Eads Medal from the St. Louis Academy of Science. He earned bachelor's and master's degrees from Case Western Reserve University and master's and doctoral degrees from Harvard. He completed postdoctoral training at Cambridge and Brown.

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