



Mechanobiology of fibrotic remodeling

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Mechanical force plays an essential role in shaping the cells, tissues, and organs of plants and animals. During the process of wound healing, extracellular matrix and cells both adapt their structure and function to cover and then contract a wounded space. The choreography of this adaptation involves recursive cues that propagate from extracellular matrix to cell and back, leading cells to transition to a contractile, active phenotype, and leading extracellular matrix to align and contract. This talk will describe work from our group on how wound-healing cells called fibroblasts feel, adapt, and remember the mechanical cues that cause them to transform 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. This talk will present quantitative engineering tools developed to understand these problems, including tightly integrated theory and experiment. Key results include a role of multiaxial stress states in determining the fate and response of fibroblast when confronted with mechanical loading.

ABOUT the SPEAKER

Guy M. Genin studies mechanobiology, with focus on interfaces and adhesion in nature, physiology, and engineering. At Washington University, he is the Harold and Kathleen Faught Professor; at Xi'an Jiaotong University in China, he serves as Thousand Talents Plan Professor of Life Sciences; and at Tsinghua University he is Distinguished Visiting Professor. Genin co-directs the NSF Science and Technology Center for Engineering Mechanobiology and is chief engineer of Caeli Vascular, Inc. Additional disclosures are available upon request.

A fellow of the American Society of Mechanical Engineers (ASME) and the American Institute for Medical and Biological Engineering, Genin co-chairs the working group on integrated multiscale biomechanics experiment and modeling for the U.S. Interagency Modeling and Analysis Group (IMAG), and serves on IMAG's steering committee. He serves on the Board of Directors of the Society of Engineering Science. Genin is the recipient of awards including a Research Career Award from the NIH; the Skalak Medal from ASME; the Changjiang Scholar Award from the Chinese Ministry of Education; the Northcutt-Coil Professor of the Year Award from the McKelvey School of Engineering; 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.

Monday, November 28 at noon
1003 Engineering Centers (Tong Auditorium)