Mechanical homeostasis and soft tissue growth and remodeling

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ABSTRACT
Homeostasis is a ubiquitous biological process that tends to maintain key regulated variables near preferred values, called set-points. Mechanical homeostasis exists at sub-cellular, cellular, and tissue levels in the vasculature and is critical to blood vessel maintenance as well as in adaptations to altered hemodynamics, disease progression, and responses to injury. In this talk, we will consider how the concept of homeostasis is fundamental to regulation of the extracellular matrix and how it can guide the development of computational approaches for modeling tissue-level growth and remodeling. Different illustrative examples will be drawn from vascular remodeling and disease progression, as archetypes of soft tissue responses, including those in tissue engineering and hypertension.

BIO
J.D. Humphrey is John C. Malone Professor and Chair of Biomedical Engineering at Yale University. He received his doctorate in engineering science and mechanics from The Georgia Institute of Technology and completed a post-doctoral fellowship in medicine - cardiovascular at Johns Hopkins University. His research and teaching focuses on vascular mechanics and mechanobiology, with particular interest in pediatric diseases as well as hypertension, aneurysms, vascular aging, and tissue engineering. He has authored a graduate textbook (Cardiovascular Solid Mechanics), an undergraduate textbook (An Introduction to Biomechanics), and a handbook (Style and Ethics of Communication in Science and Engineering), and published more than 300 archival journal papers. He served for 10 years as founding co-editor for the journal Biomechanics and Modeling in Mechanobiology, for 12 years on the World Council for Biomechanics, including as chair of the Technical Program of the 2014 World Congress in Biomechanics, and served for two years as chair of the U.S. National Committee on Biomechanics. He is a fellow of the American Institute of Medical and Biological Engineering, the International Academy of Medical and Biological Engineering, and the American Society of Mechanical Engineers, from which he received the H.R. Lissner Medal. He lives with his wife Rita of 38 years in Branford, Conn.