2018 NSE Grantees Conference Panel 3

Center for Engineering Mechanobiology

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Mechanical force has emerged as a critical component of all biological systems, providing mechanisms to sculpt plants and animals during morphogenesis, to enable cell migration, polarization, proliferation, and differentiation in response to physical changes in the environment, and to modulate the function of single molecules. Thus, mechanics permeates all of biology, and studies of genetics and biochemistry alone cannot explain how cells function or how tissues and organisms are formed. Given the ubiquitous role of mechanical force in living systems, mechanobiology will inevitably expand from a science to an applied field with broad and profound opportunities for innovation. A critical transition for the field must occur, driven by thought leaders educated in an intellectually integrated milieu throughout their graduate study. We believe that the Center for Engineering MechanoBiology (CEMB) will be the vehicle that effects such a transition; we will train students in the multilingual foundations of engineering mechanobiology and prepare them to be innovative leaders able to explore and exploit these interconnections to benefit society. Engineering Mechanobiology, with its focus on the interactions between structure, mechanics, and function in both the plant and animal kingdoms, will have a major impact on our ability to construct de novo tissues and organs, engineer new scaffolds for tissue repair and regeneration, integrate implants in reconstructive surgery, provide therapy for tissue inflammation and fibrosis, develop designer cellulose fibers, manage crops requiring lower resources and resistant to invaders, and understand the positive and negative effects of exercise, activity, and trauma. In this presentation, I will give an overview of the research, education and outreach activities of CEMB.

BIO: Vivek Shenoy is the Eduardo D. Glandt President's Distinguished Professor in the School of Engineering and Applied Sciences at the University of Pennsylvania with appointments in the Departments of Materials Science and Engineering, Bioengineering and Mechanical Engineering. Dr. Shenoy's research focuses on developing theoretical concepts and numerical methods to understand the basic principles that control the behavior of both engineering and biological systems. He has used rigorous analytical methods and multiscale modeling techniques, ranging from atomistic density functional theory to continuum methods, to gain physical insight into a myriad of problems in materials science and biomechanics. Dr. Shenoy's honors include a National Science Foundation CAREER Award (2000), the Richard and Edna Solomon Assistant Professorship (2002-2005) and the Rosenbaum Visiting Fellowship from the Isaac Newton Institute of Mathematical Science, University of Cambridge. Shenoy is the principal investigator and director of the NSF-funded Science and Technology Center for Engineering Mechnobiology established in 2016.