

Plenary Lecture



Professor Subra Suresh

Dean of Engineering
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Title: Computational Mechanics of Biological Cells and Human Disease States

This lecture will deal with a variety of interconnected themes in biomechanics that aim to examine the applications of computational mechanics of biological cells and molecules to the understanding of human diseases. Topics in biomechanics that will be addressed include: (a) coarse-grained computational predictions of shape evolution of certain biological cells in human health and disease, and shape as an indicator of disease state; (b) continuum and molecular dynamics simulations of single-cell mechanical deformation and cytoadherence for guiding and calibrating laboratory experiments; (c) simulations of nanoparticle intake in biological cells and the consequences of endocytosis for disease diagnostics, therapeutics and drug delivery; (d) three-dimensional dissipative particle dynamics simulations of the flow of blood cells through microvasculature; and (e) descriptions of new computational methods for modeling cell membrane and cytoskeletal dynamics in the context of a variety of biological processes. The presentation will cover computational cell biomechanics with particular references to different types of human cancer, infectious diseases as well as hereditary human blood disorders.

Brief Biography:

Dr. Subra Suresh is the Dean of Engineering and Ford Professor of Engineering at Massachusetts Institute of Technology where he holds joint faculty appointments in Materials Science and Engineering, Mechanical Engineering, Biological Engineering, and Health Sciences and Technology. He is recognized internationally for his contributions to the areas of mechanical behavior of materials, surface engineering, nanotechnology, and cell and molecular nanomechanics with particular connections to infectious diseases and cancer. He has authored over 200 journal articles, three widely followed books, and 15 patents. Suresh has been elected to US National Academy of Engineering, American Academy of Arts and Sciences, Indian National Academy of Engineering, Indian Academy of Sciences, Royal Spanish Academy of Sciences, Academy of Sciences of the Developing World based in Trieste, Italy, and German National Academy of Sciences. He has been elected a Fellow or Honorary Member of all of the major materials professional societies in the USA and India. A recipient of the 2006 *Acta Materialia* Gold Medal, 2007 European Materials Medal (the first non-European selected to receive this prize given jointly by 26 European materials societies), 2008 Eringen Medal of the Society of Engineering Science, and a Senior Humboldt Research Prize, Dr. Suresh holds an honorary doctorate from Sweden's Royal Institute of Technology. In 2006, MIT's Technology Review magazine selected Dr. Suresh as one of the top 10 researchers whose work will have "significant impact on business, medicine or culture".